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The International Journal of Orthodontia

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VOL. III ST. LOUIS, JULY, 1917 NO. 7

ORIGINAL ARTICLES

ORTHODONTIA—ITS PURPOSE, PROBLEMS AND POSSIBILITIES*

BY BERNHARD WOLF WEINBERGER, D.D.S., NEW YORK CITY.

THERE has existed for ages, a singular interest in the problems of how we came to be what we are, and why conditions exist as they do. We are an integral part of the series of forms and circumstances which surround us; this is not remarkable as the product of an orderly series of changes has left its record in the gradual ascending chain of organic forms.

In the past we have allowed the abnormal development of this form to continue along the line of least resistance, and through carelessness, ignorance, and indifference, have permitted, by unwisely advising patients, the child no opportunity to develop normally and under the most favorable conditions. It is then of the greatest importance to remodel the unsymmetrical features as the mental effect of a marked facial deformity has considerable influence in shaping a child's whole life.

Some of the most gratifying results of orthodontic treatment are seen in its influence upon mentality. When the bones of the face and head are undeveloped, and the nasal cavity is filled with adenoids and polypi, the child becomes stupid, inattentive, forgetful, and lacks the power of concentration because these growths obstruct the lymphatic circulation of the brain and prevent it from receiving the supply of nutrition necessary for its development.

The protruding upper lip, completely overhanging the characterless chin and retruding mandible, the lack-luster eye and lackadaisical expression are readily responsive to correction. Mouth breathing with adenoids and enlarged tonsils, and contracted nasal passages that are associated with it, can and should be improved.

Regularity of features and general animation of expression forms the distinguishing characteristics of the mouth, thus, strength of character is frequently judged wrongly by the expression about the mouth.

*Read before the Eastern Dental Society of the City of New York, April 5, 1917.

Early in the history of medicine, physicians recognized that specialization was essential, that the best and ablest could not obtain sufficient knowledge and skill to practice all its branches, and those who devoted a part or all of their time to certain fields were most likely to succeed. As men began to pay more attention to the teeth, dentistry came into its own as a profession, and through its development a greater appreciation of the importance of the preservation, development, function and relation of the teeth to the face has resulted. The continuation of this same appreciation, with the greater development of the above factors has brought about the science of orthodontia. Orthodontists might be called masters of individuality, inasmuch as they are daily engaged in attempts to change that portion of the human framework which contributes the most towards making up of that great factor. Therefore men who are engaged in orthodontia and in correcting irregularities of the teeth, are in duty bound to respect that field, to thoroughly understand not only the teeth, their structure, tissue changes, bone growth, peridental and adjacent membranes, but at the same time appreciate the importance of facial development, as well as the changes incidental to tooth movement and occlusion.

The dental apparatus has a much more complicated mission in life than masticating food. It is a complex structure with numerous functions into which enter not only the jaws, teeth, dental arches, alveolar processes, nasal passages and sinuses, but also the muscles which move the jaws, lips, tongue, palate, and throat.

Orthodontia deals primarily with the normal development of the dental arches and the teeth. It is directly associated with the internal and external face, and indirectly with the functions of nutrition, digestion, and respiration; hence to the series of related structures and functions, with the development and health of the whole bodily system.

The arrest of the growth and the disturbances of the function of the internal and external face, associated with many cases of malocclusion, are but symptomatic expressions of the disturbances of balance in nutrition and respiration, or of other vital functions; therefore, in general, malocclusion of the teeth may be considered the objective symptom of abnormal development of the dental arches, and the consequent arrest or deficiency of growth.

Until the importance of normal occlusion was thoroughly understood there was some justification for the use of empirical methods, both in diagnosis and treatment. Extraction of teeth to correct the deformity was then permitted, but not today.

Beside the knowledge of normal occlusion, a clear and certain conception of living bone tissue and its responsiveness to mechanical stimulation is just as important to the practice of orthodontia as the physiological effect of the use of drugs is to the practice of medicine. There are certain obscure principles to be observed in order to produce the desired results. These principles concern the physiological reproduction of bone induced by a given pressure. This is a subject that has never received the attention that it deserves by dentists or physicians. To orthodontists it is the foundation of structural work. I can think of nothing that is of greater importance, as in stimulating bone to its normal development, abnormalities can be corrected.

Noyes[1] defines bone, "as a connective tissue whose intercellular substance is calcified in layers which tend to be arranged around nutrient canals or spaces, with the cells arranged in cavities (lacunæ) between the layers and receiving nourishment through very minute canals (canaliculi) which radiate from the lacunæ throughout the layers." A study of the relation of bone shows three types of structures differing in the arrangement of the structural elements.

"The jaws are endo-membranous in their origin, but very early in their development a periosteum is formed over the surface of the bone already formed, and from that time on the growth of the bone as an organ is through the functions of the periosteum, together with the articular cartilages and the peridental membranes. By these tissues the bone is built up, but by the periosteum the surface is sculptured and molded into form, and by the osteogenetic tissues inclosed within the surfaces of the bone the internal structure is constantly being rebuilt, so as to adopt the organ to the forces to which it is subjected with the least possible weight. The more carefully this is studied the more evident it becomes that bone is formed and removed in response to mechanical stimuli, and that the entire surface is arranged in harmony with the mechanical stresses which result from the forces applied to the teeth and the surface of the bone."[2]

Albin Oppenheim[3] a few years later proved, by employing spring arches and wire ligatures, on monkeys, that positive changes do take place in the bone tissue incident to tooth movement, and that these changes occur in a definite and characteristic manner.

"Bony tissue," says Oppenheim, "be it compact or cancellated, reacts to pressure by a transformation of its entire architecture; this takes place by resorption of the bone present and deposition of new bony tissue; both processes occur simultaneously. Deposition finally preponderates over resorption. The newly formed bone spicules are arranged in the direction of the pressure. Increased pull has similarly addition of new bony tissue as a result, and simultaneous orientation of the spicules thereof in the direction of the pull.

"The entire transformation of the architecture and the orientation of the newly formed spongy bone spicules, always occur so characteristically and lawfully, that we can say by the histological preparations in what manner the movements were accomplished.

"This characteristic transformation results only upon the application of very slight, physiological-like influences.

"Should the force be too strong, the result will be such serious injuries to the periosteum, due to the disturbances in circulation, that there will be no typical reaction of the bony cells."

These experiments of Noyes and Oppenheim have brought about the present method of treating orthodontic cases, reducing the size of the expansion arch, at the same time proving definitely that slow movement is the correct procedure.

In addition to bone growth, various glands are stimulated to normal secretion, thus increasing nutrition to the brain by removing the pressure from the lymph and blood vessels. This has been proved by the Binet-Simon tests, for determining mental age. Backward children who are years younger in mind than in body, while under orthodontic treatment, show an advance in their reasoning powers, in their mental quickness and acuteness, that is most gratifying.

NORMAL CONDITIONS.

In our problems in orthodontia, let us first consider a normal mouth; unfortunately it is rarely met with today. An important factor in the study of oral hygiene is the fact that a perfect denture in normal use is practically self-cleansing, it presents the least opportunity for the lodgment of food, and the action of the lips, cheeks, and tongue in brushing the surfaces of the teeth, together with the action of the saliva, comes nearest to making them self-cleansing. In mouths where malocclusion exists, cleanliness is impossible. The crowding and overlapping of the teeth create triangular spaces in which food will accumulate, thus supplying a fertile field for the development, not only of bacteria which attack the surrounding tissues and produce pyorrhea and the decay of teeth, but also of those of infectious diseases.

Scarcely second in importance comes the matter of mastication. As a nation we have acquired the habit of bolting our food and consequently the lack

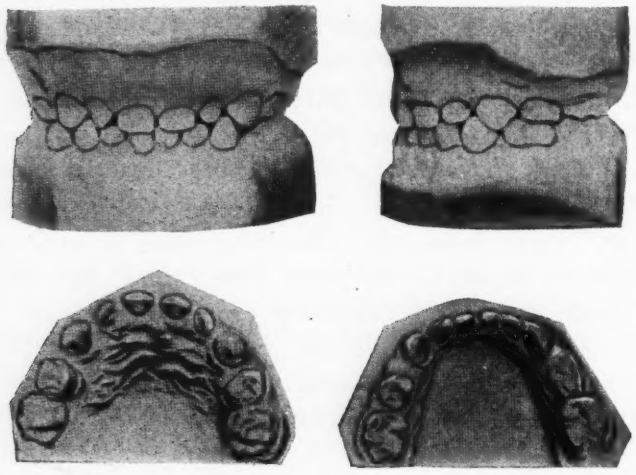


Fig. 1.—Normal occlusion in child four years old; occlusal surfaces, upper and lower dental arches.

of the full use of our teeth. Too little mastication has a very injurious effect upon the development of the dental arches. Proper nourishment, as well as plenty of oxygen, is as essential to the normal development of the child, as exercise. If we would insure immunity from dental ills, we must guard the general health from infectious diseases and give the child its full opportunity for complete and harmonious development. To maintain this condition of cleanliness and health, the dental arches must have the "full complement of teeth," the arches must be nearly symmetrical, occlusion perfect, and mastication and respiration normal.

The Arches of the Temporary Teeth.—In order to have a clear conception of what constitutes occlusion, it is necessary to study the dental arches at the time when the deciduous teeth are all in their proper positions, and certain physiological processes are to take place, subsequent to the shedding of the temporary teeth and their replacement by the permanent teeth. In a great percentage of cases, malocclusion begins at the time when these processes are taking place. Fig. 1 shows, at the age of four years, a perfect development of the deciduous

arch in normal occlusion, at which time all of the deciduous teeth are in position and accomplishing the proper functions of mastication. Note the regular spacing between the teeth to make room for the permanent teeth which are a third larger than the deciduous, and the general roundness of the arch. Were this spacing present in every deciduous arch, orthodontia would be unknown. Fig. 2 illustrates the relation of deciduous teeth to the skull as a whole.

Fig. 2.—Relation of the deciduous teeth to the skull as a whole.

Fig. 3.—Occlusal surfaces of the upper arch; same child, four, six and a half, and eight years old, showing growth and development.

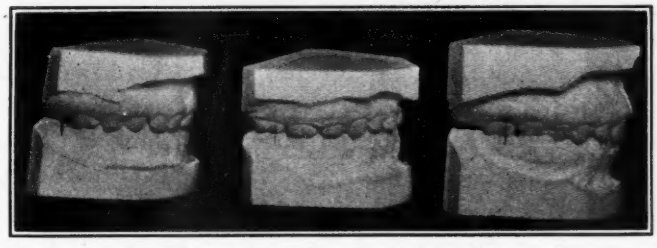


Fig. 4.—Side view of case shown in Fig. 3.

As the deciduous dental arch increases in size, the growth takes place in three dimensions—length, breadth, and height. Fig. 3 illustrates the upper arch of the same child, at four years, at six and a half, and at eight years of age. In the four years the alveolar process has grown downward in the upper arch,

and upward in the lower, the first permanent molars (sixth year molars) have come into occlusion, holding the arches in their proper relations. Fig. 4 shows the extent of development in length and breadth of the same cases placed side by side.

A study of the series of skulls from infancy to maturity will greatly aid in appreciating the growth of the jaws.[4] At birth all the deciduous teeth have developed and are embedded in the cancellous substances of the maxilla. When the crowns of the teeth are formed they are enclosed in crypts in the bone. The mandible is almost straight from the symphysis to the condyle, the angle is obtuse, and as the tooth develops within its crypt, pressure is exerted and the crypt wall is pushed backward through the cancellous bone. The bones of the face are not compact and rigid, but contain millions of active cells which are constantly building and rebuilding bone lamellæ, the result of mechanical influences to which the bone as a whole is subjected.

Some time between the seventh and ninth months the first incisors push through the roofs of their crypts and begin to erupt, causing absorption of the bony covering. The continued growth of the roots forces them occlusally and

Fig. 5.—Maxillæ about six to eight months. Note the relation of the cribriform tube to the crypts of the teeth. (Series from the Army Medical Museum, Washington, D. C.)

Fig. 6.—About one year, showing relation of unerupted teeth.

the bone grows up, from the margin of the crypt, around them, increasing the thickness of the bone from below upward. (Fig. 5.)

At one year, all of the incisors are erupted and the temporary molars and cuspids are developing rapidly. (Fig. 6.) The roots are not fully formed, and each successively posterior tooth lies deeper in the bone so that their development transmits pressure which causes the teeth, already erupted to move either upward or downward, and forward and outward. The tooth germ in developing, exerts a pressure that causes the crypt wall to be pushed through cancellous bone until the resistance below is greater than the resistance above. In all the following illustrations of dissected skulls, I wish to call attention, particularly, to the relation of the lower wall of the crypt, the roots of the teeth and the inferior dental nerve canal. This relation, if not normal, will produce a nervous phenomenon that is so often found associated with the eruption of the teeth, for the entire surface of the gums, as the teeth erupt, are subjected to pressure which is the result of the growth of the enclosed organs.

At a year and a half the first temporary molar has erupted. At this age the roots of the incisor teeth have completely formed, carrying the lower teeth upward, forward and outward; the upper teeth downward, forward and outward. (Fig. 7.) They, as well as the entire bone, are moving in three dimensions of space. There is bone formation by the periosteum, peridental membrane and articular cartilage which is being transformed within, and, in fact, on all its surfaces. The bone formed today by the periosteum and the peridental membrane is next week destroyed and replaced by the Haversian system bone, only to be destroyed again, and again replaced.

At two and a half years (Fig. 8) the temporary dentition is complete and now the growth of the permanent teeth produces pressures which continue to force the temporary teeth occlusally, forward and outward. From this time until six years the temporary teeth, alveolar process and all, are moved through space, largely by the force of the developing permanent teeth.

While the temporary teeth are erupting they are continually being carried

Fig. 7.—Maxillæ about one year and a half.

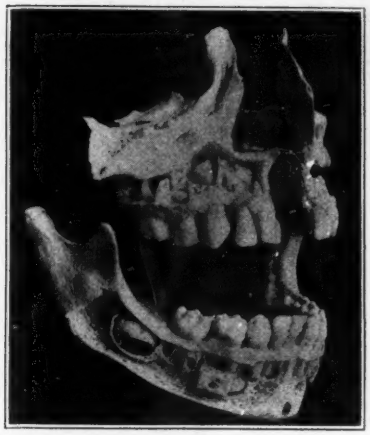


Fig. 8.—Maxillæ about two years and a half.

occlusally by the growth of their roots, the alveolar process growing up around them. As the roots of the anterior teeth are completed they are still pushed forward, upward and outward, by the development of those distal to them. As soon as the temporary dentition is complete, the temporary teeth—alveolar process and all—are forced to move in three dimensions by the development of the permanent teeth, which lie in the crypts below them. The growth of the permanent incisors and cuspids first causes the development, chiefly in the anterior region; between the median line and the region of the mental foramen in the mandible, and from the suture to the cuspid region in the maxilla, and later the development of the bicuspids and second and third molars cause the growth which increases the distance from the mental foramen to the ramus. The development of the long roots of these teeth will carry the temporary teeth, alveolar process and all, occlusally, forward and outward.

If we examine sections of the alveolar process about the temporary teeth we shall see that this growth is accomplished by the formation of subperiosteal bone on the outer and inner surfaces, and subperidental bone at the margin of the process and around the alveolus.

In the production of the alveolar process the peridental membrane and the periosteum work together.

At about six years of age the first permanent molars erupt (Fig. 9) and take their place at the distal of the deciduous teeth. The way in which they lock determines the relation of the jaws to each other, as a deviation from the normal relation will entirely change the direction of the forces and will manifest itself in a modification of the development of the bones. They, being the strongest, as well as the largest teeth of the permanent set, bear the chief work in mastication, during the period of transition, while the permanent teeth replace those of the deciduous. They not only do the greatest work in mastication, but maintain the relation of the jaws to each other, for they act as a fulcrum which

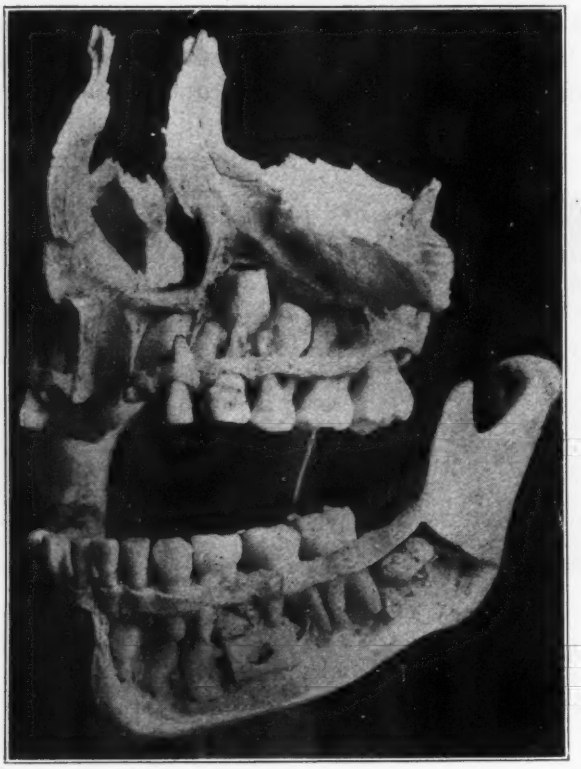


Fig. 9.—Maxillæ about six years, showing first permanent molar, crowns of the developing permanent teeth; complete deciduous dentition. (Wistar Institute.)

balances the distribution of muscular force upon the jaws. If their relation is not normal each permanent tooth is disturbed as it erupts, causing all of the forces of muscular action to be perverted, thereby altering the distribution of functional forces upon the bone.

The first period of growth in the incisor region is caused by the growth of the permanent incisors and cuspids. This I would like to analyze more closely if time would permit. In the skull of about six years the first molars are in full occlusion, though their roots are not more than half formed. (Fig. 9.)

All the temporary teeth are now in their place, with the second molar in its crypt, and the bicuspids below the temporary molars. The growth of the dental papillæ for the cuspids has pushed back the floor of their crypts through the can-

cellous bone until the upper has reached the solid bone at the base of the malar process and the lower has reached the solid cortical layer at the lower border of the mandible. The lower centrals are being carried upward by the growth of their pulps in the conical ends of their half formed roots. The laterals lie

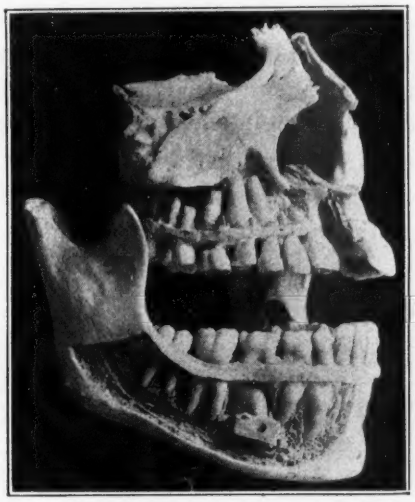


Fig. 10.—About the tenth year, second permanent molar partially erupted.

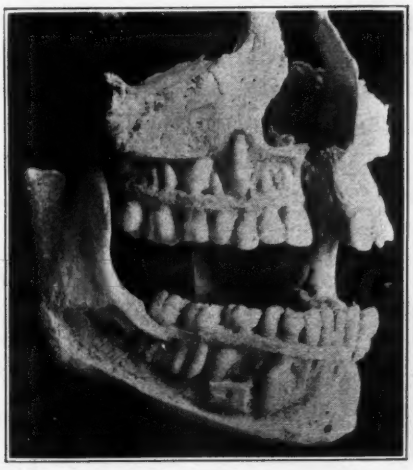


Fig. 11.—Maxillæ about the twelfth year, second permanent molars in position.

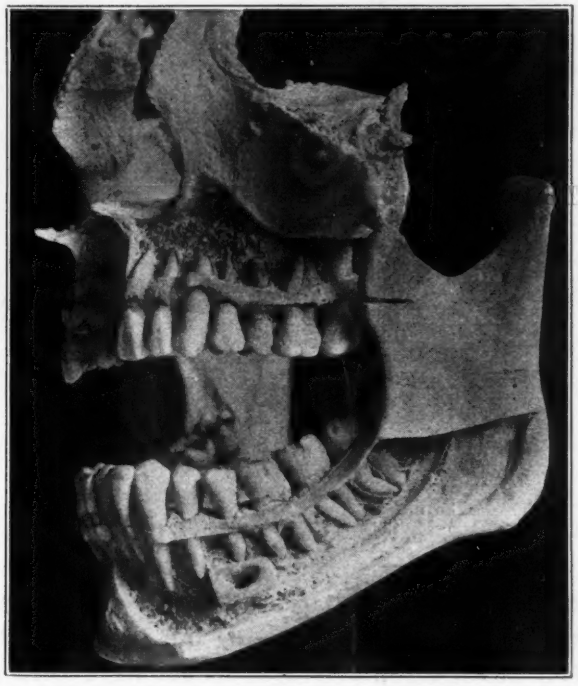


Fig. 12.—Adult dentition. Note the distance from the apices of the teeth to the lower border; and the relation of the cribriform canal.

to the lingual of the temporary cuspids. In the upper the central crypts rest against the solid bone of the floor of the nose, the lateral against the cuspid, and the cuspid against the base of the malar process. Their growth carries the temporary teeth and process forward, creating additional space between

the incisors and cuspids thus enlarging the arc. It is perfectly apparent that to have the result the teeth must preserve their normal contacts. If one incisor slips by to the lingual or labial it must be forced to lap more and more, and the arches are narrowed in proportion. There is no possibility that the bone will grow and make room for them; the mechanism which should cause the growth has "slipped a cog." The growth from the symphysis to the mental foramen in this period is then not an interstitial growth of bone, but a building on at the surface and rebuilding within, under the influence of mechanical conditions.

The growth of the bicuspids, and the second and third molars, augmented by the action of the inclined planes in occlusion, caused the development in the second period, and the increase in the distance from the mental foramen to the ramus. The forces at the back transmitted through the contacts, caused the teeth and bone to continue to move in the same direction. (Figs. 10 and 11.)

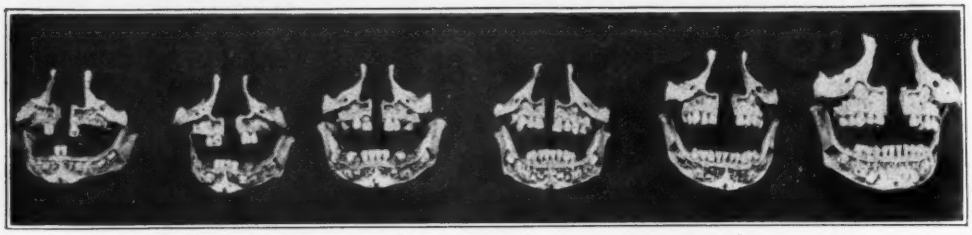


Fig. 13.

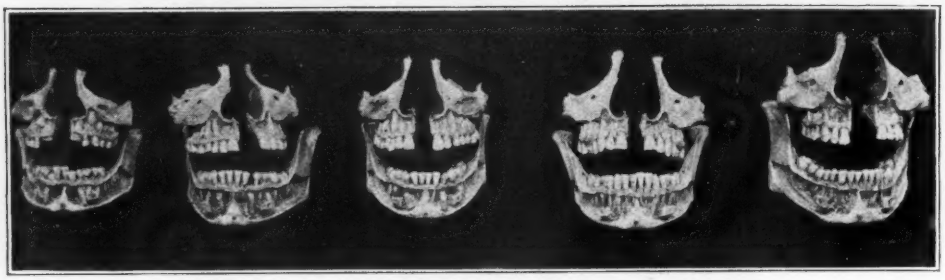


Fig. 14.

Figs. 13 and 14.—Series of front views of previous skulls illustrating the growth of the maxillæ and mandibles.

After the second molar is in place the growth of the third should continue the action (Fig. 12).

During early childhood, in those cases where there has been a lack of vigorous mastication, and neglected use of the teeth; where there has been too little force applied in the action of the muscles in swallowing and respiration to create the necessary mechanical stimuli for carrying out the above development, there results a consequent lack of stimulus that should have been given to the cells of the bone. It is in such cases that we find this resistance so great, as to allow the teeth, especially the third molar to remain unerupted or impacted.

During the period of development of the teeth, we find the deciduous teeth under the influence of the permanent, move through three dimensions of space, in an occlusal, forward and outward direction. This growth is first chiefly in the anterior region, and then in the posterior. Between five and eight years of

age besides all of the deciduous teeth, we find all of the crown of the permanent set fully formed and occupying practically all of the space from the roots of the deciduous teeth to the cortical plate in the lower and the floor of the nasal chamber and the roots of the deciduous teeth of the upper. The permanent cuspid has pushed through its crypt into the cancellous bone until in the lower it rests against the inferior border of the mandible, while in the upper it is against the solid bone at the base of the malar process. All the teeth lie lingual to the roots of the deciduous, the central braced against the lateral, the lateral against the cuspid, the cuspid against the first premolar, and so on. As the roots of these teeth are formed they carry the teeth occlusally and outward.

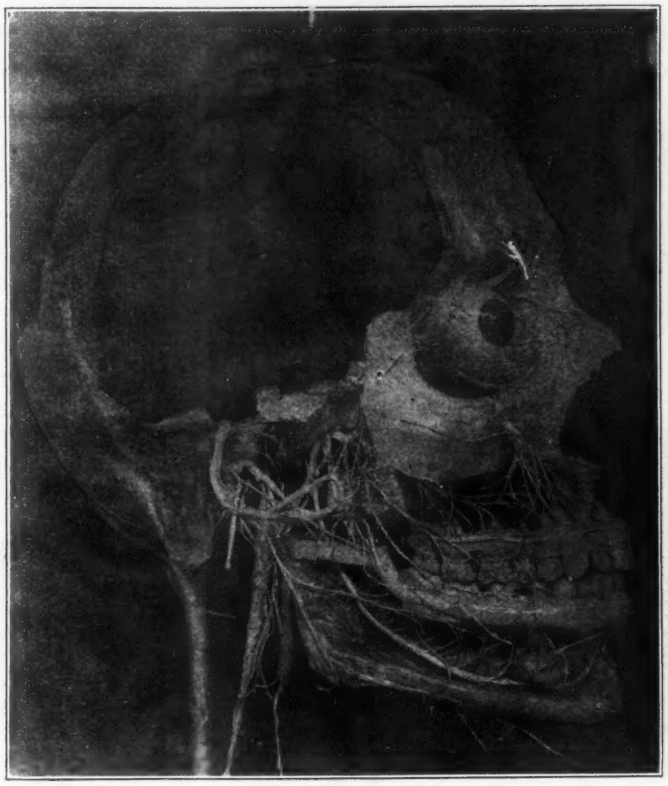


Fig. 15.—Skull showing the wide distribution of nerves within and the close relation of the 5th, 6th, 7th, 8th, 9th, 10th, 11th, and 12th cranial nerves.

This development should move the deciduous teeth apart and they should become widely separated before being lost. If separation of the teeth has not occurred, the development is below normal.

We have seen then that the bone has not only been built on at the back, but that forces within it, at the back, and around it, have carried the anterior part forward. A series of front views of the same skulls, illustrate this growth (Figs. 13 and 14).

Some writers have minimized the importance of the causes of malocclusion, saying that orthodontists were not concerned with how the teeth came to be out of position, but with placing them in position. The first step toward the treatment of any case is to determine which of the forces of occlusion are

lacking or perverted, and the supplying of them by artificial means. The causes acting become the basis for the diagnosis, the treatment given and the prognosis. The perversion of forces in any case is by no means a simple problem, but upon the correctness of its solution depends the success of treatment. Teeth may be moved in any direction and almost to any extent, but they will remain only in the position in which all the forces to which they are subjected are balanced.

Before leaving this series illustrating bone growth, there remains one factor to which I wish to call attention, and although I can only dwell on it briefly, too much importance can not be given to it.

During the development and eruption of the teeth, the jaws are continually being rebuilt and transformed within, they are growing under the influence of mechanical stimuli, and in order to reach the full normal development, vigorous normal function is necessary. Where this has been normal, as the skull develops, there necessarily must be an increase in the distance from the floor of

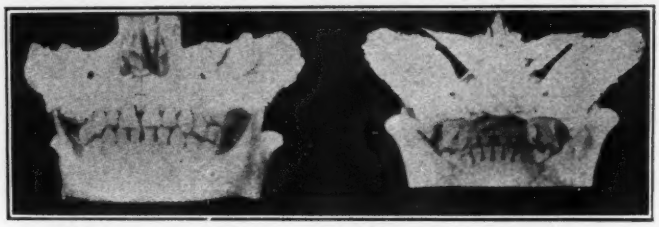


Fig. 16.—Skull; normal occlusion in a child five years of age.

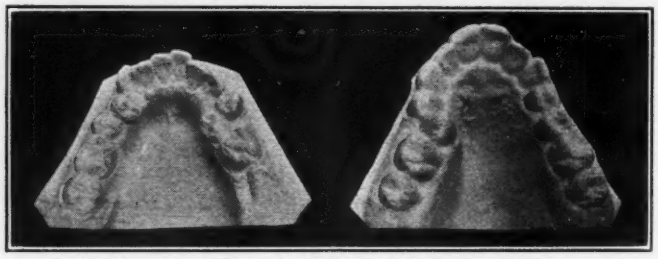


Fig. 17.—Premolars forced to erupt within the dental arch.

the orbit, or the floor of the nose, to the occlusal edges of the teeth. The inferior dental nerve should lie free between the apices of the roots of the teeth and the inferior border of the jaws, otherwise enough pressure will be produced to cause a reflex action and nervous symptoms.

The nerve supply of the teeth and associated structures are governed by the trifacial or fifth nerve, the largest of all cranial nerves. Fig. 15 shows the wide distribution within the skull, its close relation to the nerves and to the plexus and ganglia of the sympathetic system. "The intimate relations which the trifacial nerve bears with the points of origin of the sixth, seventh, eighth, ninth, tenth, eleventh, and twelfth cranial nerves in the floor of the fourth ventricle possibly explains many of those phenomena which are considered as reflex in character, and whose starting-point seems to depend upon some irritation of the fifth nerve, by means of various branches."[5]

Fig. 16 shows the skull with normal occlusion in a child of five years of age. Note the occlusion on the lingual surface.

To have a normal permanent arch retaining the deciduous teeth is of the greatest importance. These teeth are to serve until their permanent successors erupt; their presence aids development and their premature loss insures almost certain irregularities of the permanent teeth and invariably causes a retardation of development of the maxillary arch.

The sockets of the lost deciduous teeth will fill with new osseous tissues, hard enough in many cases, to turn the permanent tooth from the proper position, or through the forward movement of the teeth the spaces will close up, so that the permanent tooth will be compelled to erupt either inside or outside the arch. (Fig. 17.) The time to extract is when the permanent successor

Fig. 18.—Radiograph showing unequal absorption of the deciduous molar, thereby preventing the tooth from falling out.

Fig. 19.—Series showing teeth that had to be extracted as they were held in place owing to unequal absorption of the roots. The one on the extreme right is shown in Fig. 18.

is about to erupt, when abscessed, or when pericemental necrosis contraindicates further retention.

Prolonged retention is just as serious as the early loss of the deciduous teeth, especially the two deciduous molars. If these have not been lost by the twelfth year, radiogram should be taken to ascertain if the premolars are present, and if present, they should be extracted immediately. There are cases where the absorption of the roots of these teeth are unequal, as shown in the radiogram (Fig. 18). This explains the retention of these molars until fourteen years or longer, thereby causing the impaction of the permanent teeth.

OCCLUSION.

As occlusion is the basis of the science of orthodontia, we must know what it means. According to Angle: "Occlusion is the normal relation of the oc-

clusal inclined planes of the teeth when the jaws are closed." By referring to Fig. 20, which represents the teeth in normal occlusion, it will be seen that the external curve of the lower jaw is slightly smaller than the upper, so that in occlusion the labial and buccal surfaces of the teeth of the upper arch extend slightly over the lower. Normally each tooth of the dental apparatus oc-

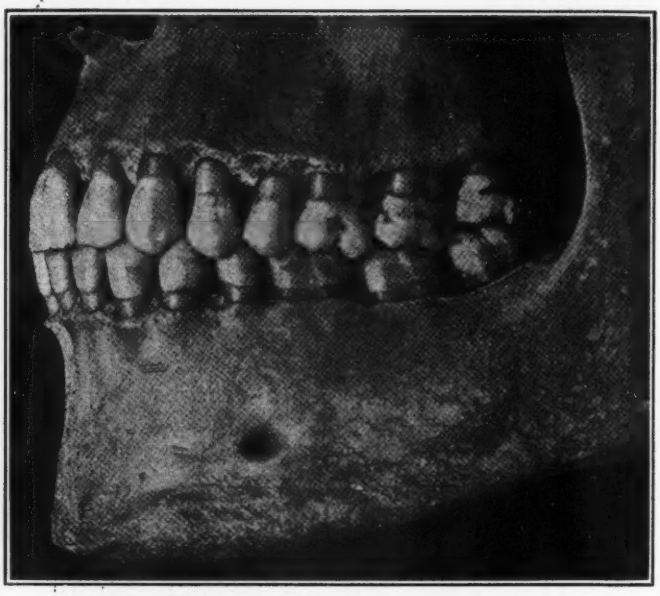


Fig. 20.—Normal occlusion. (Peeso.)

Fig. 21.—Showing the linguo-occlusal relations. (Peeso.)

cludes with two in the opposite jaw, with the exception of the lower centrals and upper third molars. The incisors and canines occlude so that the incisal edges of the lower incisors and canines come in contact with the lingual surfaces of the corresponding teeth of the upper jaw near the incisal edges. The mesiobuccal cusp of the upper first molar is received into the buccal groove of the lower first molar. The teeth posterior to the molar engage with their antag-

onists in a precisely similar manner; those anterior interlock with one another in the interspaces, until the incisors are reached; of these the upper teeth usually overhang the lowers for about one-third the length of the crowns. The length of the overbite of the anterior teeth is the same as the lengths of the cusps of the molars, premolars, and canines. Fig. 21 shows the linguo-occlusal relations, except that the lingual cusps of the lower buccal teeth project beyond those of the upper into the oral cavity. In the transverse arrangement, the buccal cusps of the lower molar and premolar occlude with the buccal cusps of the upper; and the lingual cusps of the upper molars and premolars occlude with the buccal and lingual of the lowers. (Fig. 22.) By this arrangement, one-half of one tooth is always in occlusion with one-half of the opposite tooth. Nature has taken care to assure the retention of corresponding teeth through loss, by extraction or otherwise, and thus prevent rotation and elongation and the collapse of the entire arch.

In a careful study of the above occlusion one must not lose sight of a number of important factors. The occluding contact points must not be considered as surfaces or cusps, but planes; and while the occlusion of the central

Fig. 22.—Transverse arrangement. Normal occlusion of molars. (Cryer.)

and laterals is a simple arrangement, that of the canines, premolars, and molars is more complicated. In the case of the canine in place of one cusp we find four inclined planes, while the premolars occlude at eight instead of merely two points. On the other hand each of the molars present sixteen inclined planes, and not four cusps or points. The four inclined planes of each cusp, in turn, occlude with four of the inclined planes of four different cusps.

MALOCCLUSION.

Malocclusion of the teeth is simply a variation of these normal relations. It is a disturbance in the development of the dental arches that later interferes with the functions of respiration, mastication, and speech, thereby altering the dental apparatus, as well as the facial expression.

Etiology of Malocclusion.—Before discussing the causes of malocclusion, we must call attention to the impossibility of treating adequately this subject here. Were this to be gone into thoroughly, it would require a paper of great length, hence it is my purpose to interpret only certain common conditions pro-

duced by definite causes. The etiological factors of malocclusion may be divided into two groups, general, or constitutional, and local.

General or constitutional causes include those that affect the general functions of metabolism to such an extent as to interfere with the development of the teeth or the surrounding structures; e.g., diseases of childhood, such as rickets, measles, scarlet fever, and similar diseases affecting the epithelial structures; syphilis; faulty development caused through improper foods; bottle feeding; prenatal conditions and lack of use of the teeth through improper mastication.

Among the local causes are the early loss of deciduous teeth; prolonged retention of deciduous teeth; tardy and noneruption of permanent teeth; bad dentistry; supernumerary teeth; bad habits, such as lip biting and lip sucking; tongue habits; mouth breathing; adenoids and tonsils; abnormal frenum linguæ.

Early Loss of Deciduous Teeth.—The value of the deciduous molars in mastication is universally recognized by the profession, and an urgent appeal should be made to the parents for their preservation. The early loss of the deciduous incisors cause a lack of development in the anterior region of the arch. The early loss of the canines permit the incisors to drift toward the

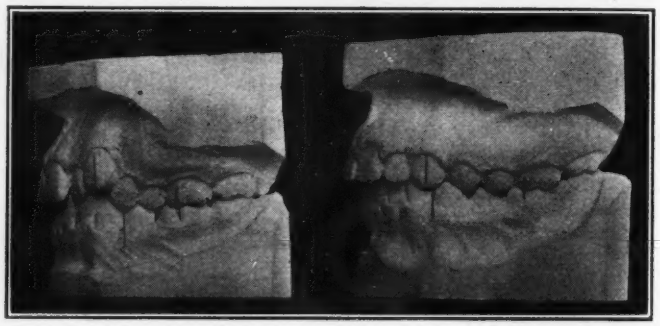


Fig. 23.—Results of early loss of the deciduous incisors; incisors in contact with the premolars. Same case corrected, canine brought back into its proper place through expansion of the arches.

side from which the tooth is missing, often allowing the incisors to come in contact with the deciduous molars, thus preventing the permanent canines from coming into their proper position. (Fig. 23.) The loss of the deciduous molars permits the first molar to drift forward, resulting in an abnormal mesiodistal relation of the first permanent molar, and often in an impaction of the premolar when it attempts to erupt. The loss of the approximal surfaces of the deciduous teeth through caries, results in a lack of arch development, and such carious conditions should be observed in their earliest stages, and fillings inserted so that the approximal contact points may be restored.

Loss of Permanent Teeth.—A large proportion of malocclusion found in adults is the result of the loss of the permanent teeth. The tooth most frequently lost and the one that produces the malocclusion most difficult to treat, is the permanent first molar. Through the loss of these molars, the masticating apparatus is destroyed, the occlusion of the teeth ruined, and one of the greatest factors in pyorrhea is established (Fig. 24). To the student of occlusion, the changes in occlusal relations after the first permanent molar has been lost, are more or

less well known, and it is comparatively easy to foretell what will occur, and to follow the stages whereby the ruin of the whole dental arches has been accomplished. Loss of the first permanent molar allows the second molar to tip forward, and this is followed by the drifting distally (posteriorly) of the teeth mesially (anteriorly) to it (Fig. 25), destroying the occlusion of that side or both sides of the mouth, and contracting the arches, both upper and lower. The effect of this can be seen in the overlapping of the anterior teeth. In addition, the incisors will be found to occlude against the gum margin of the upper teeth as in Fig. 26, instead of the upper third of the upper teeth as in Fig. 20. A frequent question asked of the specialist by parents and practitioners is as to

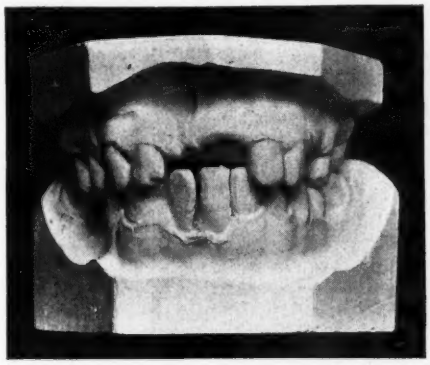


Fig. 24.—Cast of a young girl, fourteen years of age, teeth lost through pyorrhea.

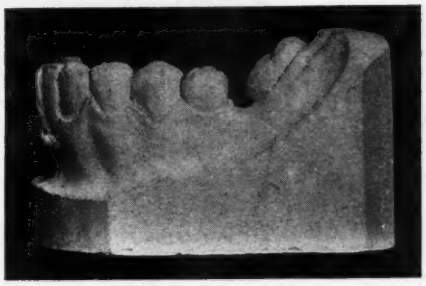


Fig. 25.—Model showing the left second molar tipped, drifted forward, due to the extraction of the first molar.

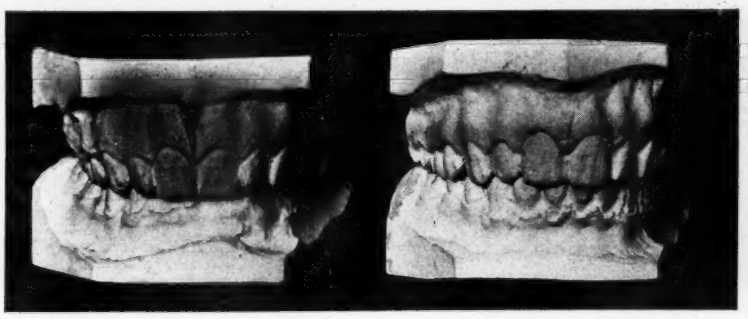


Fig. 26.—Showing the under teeth elongated and entirely over the lowers; *b*, corrected, the lower teeth no longer in contact with the palate.

the advisability of extraction of one or more of the deciduous, as well as of the permanent, teeth in order to "make room" for other teeth. That is a false theory, and one that has caused no end of trouble. Instead of the arch being made larger, the reverse is true, and the arch already contracted becomes so much more so. The result is the shortening of the arches (Fig. 27), producing a facial deformity in which the chin is too close to the nose, and there is a sunken appearance about the mouth. (Fig. 28.)

Mouth Breathing.—Mouth breathing has long been recognized as a cause of malocclusion, and is generally the result of adenoids. It is an accepted fact by both rhinologists and orthodontists, that a hypertrophy of the pharyngeal

tonsils, commonly known as adenoids, will produce a malformation of the superior and inferior maxillæ and adjacent parts. Nasal obstruction is the indirect cause of this maldevelopment. The direct cause is the constant prevalent muscular action, causing mouth breathing. (Fig. 29.) The growth of the nasal cavity affects the growth of the maxillary bones, and likewise anything that affects the growth of the maxillary bones will have an influence on the nasal cavity. Muscular pressure plays an important part in development. (Fig. 30.) Normal respiration during the developmental period exerts the greatest influence upon the growth of bone. With the mouth closed, the lips are pressed against the labial surfaces of the incisors, the lower lip covering about one third of the upper incisors. The tongue fills the vault of the palate and presses against the lingual surfaces of the teeth and bone. The air being partially exhausted

Fig. 27.—Showing the dental arches shortened; lack of alveolar process due to noneruption of teeth.

A *B*

Fig. 28.—Showing facial deformity in which the chin is too close to the nose, with sunken appearance about the mouth. See Fig. 27 showing the dental arches.

by the soft palate lying against the base of the tongue, causes a downward pressure against the nose. In mouth breathing the tongue does not exert force on the upper teeth, and therefore allows the maxillæ to remain undeveloped. As a result of atmospheric pressure, the mandible drops down, the depressor muscles preventing it from developing forward.

The function of deglutition is quite as important as that of breathing, and is seldom if ever normal in abnormal breathers. With each act of deglutition the teeth are pressed firmly together by the contraction of the elevators of the mandible, exerting pressure upon the lingual surfaces of the upper teeth and the buccal surfaces of the lower. This causes a mechanical stimulus for the growth of bone carries the apices of roots buccally and lowers the roof of the

mouth, consequently increasing the depth of the nasal cavity from above downward.

Expanding the arch of a young patient, while it may not actually lower the floor of the nose and straighten a defected septum, has the effect of relieving the upward pressure and preventing the further development of a deflected septum. It is useless to correct a deflected septum and remove adenoids and tonsils, and yet allow mouth breathing to continue, and not try to establish normal occlusion and render normal breathing possible. It is just as useless to try to establish normal occlusion of the teeth without first removing the primary cause of the mouth breathing. The rhinologist for the success of his work is, in many cases, dependent upon the orthodontist.

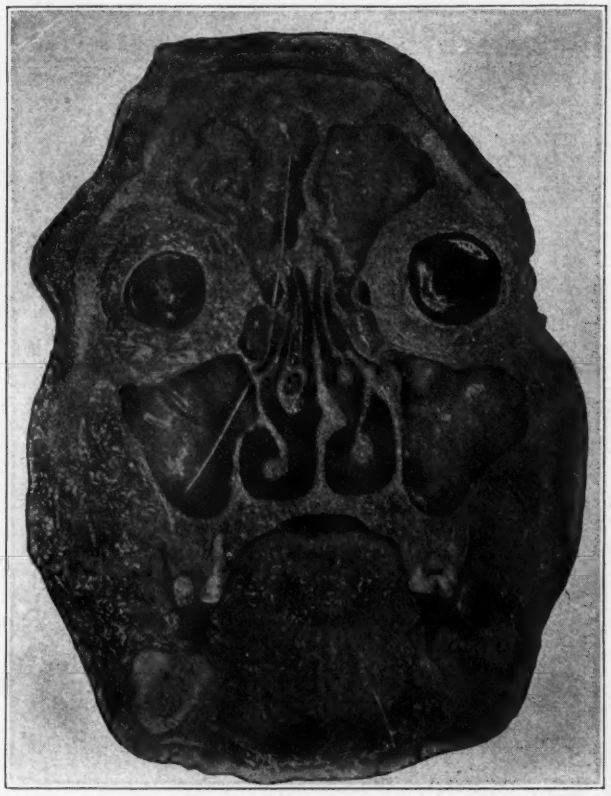


Fig. 29.—Frozen section. (Cryer.)

Early Disturbances.—Disturbances in development occur in early life. Both pronounced protrusion and retrusion have been observed by the author, in children three years old or younger, even at birth, indicating defects in development perhaps congenital in origin (Figs. 31 *A, B, C,* and *D*). These disturbances occurring in early life, if not corrected before the seventh year, in some cases earlier, lessen the possibility of permanent benefit, especially in the establishment of normal respiration.

One of the most beneficial results—perhaps the greatest—of the study of occlusion, as well as prenatal influences, has been the change in the time for beginning treatment. Under the old idea it was necessary to wait until the patient was thirteen or fourteen years old, until the second molars and all the

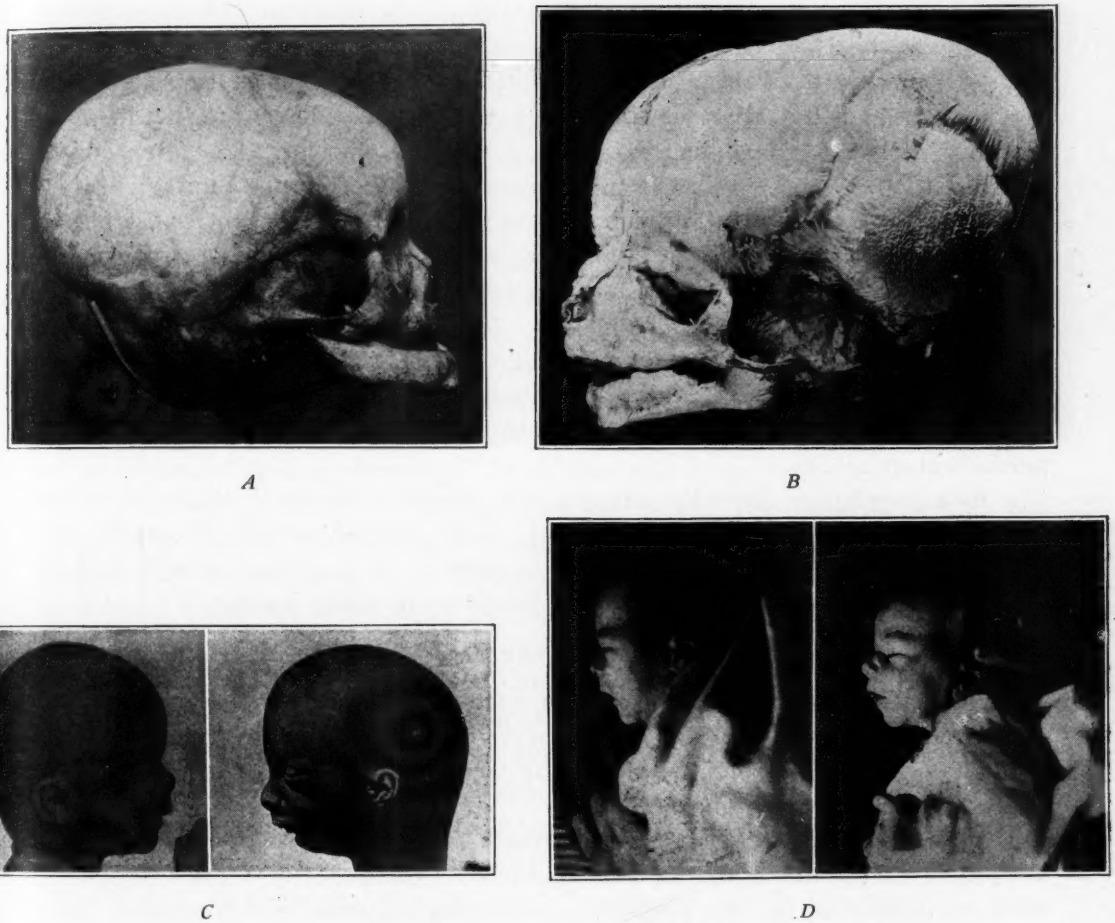
permanent teeth had erupted before treatment was begun. Now cases *should be completed* by the time the second molars are in full occlusion and all the cusps normally locked (twelfth year). Early treatment should be and is advised as these cases are always progressing (Fig. 32). As soon as a definite defect in the mechanism of development is discovered, then is the time to correct it, in order that development may not progress abnormally, thereby destroying

Fig. 30.—Section of frozen skull showing adenoids and tonsils.

the hope of overcoming prolonged conditions caused by improper occlusion, facial expression, and structural changes in osseous and muscular tissues which can not be benefited by treatment.

Treatment.—A word or two in regard to "regulating appliances" and "sys-

tems" used in treating malocclusion of the teeth. Regulating appliances are but mere mechanical devices for the purpose of bringing malposed teeth into their proper positions and occlusion, by creating cell activity. The appliance must be mechanically perfect, otherwise pressure is exerted in the wrong direction



A *B* *C* *D*

Fig. 31.—*A, B, C, D.* Series illustrating a disturbance in development at birth.

Fig. 32.—Showing a progressive case, six months, one year, eight years.

and the work will result in failure. The mere exertion of force is not sufficient to allow the teeth to assume a proper position in the "line of occlusion;" the movement must be physiological, and cell activity must be created.

Teeth can be moved anywhere, but where improper force has been used

they can not be held in their new position, and considerable suffering is caused. Time is the one great factor in orthodontic work; old bone must be destroyed, cell activity must be created, and new bone formed.

Regulating appliances are of two types, fixed and removable. Fixed appliances are those placed on the teeth in such a manner as to be removed at the to be handled or removed only at the will of the operator. Removable appliances are those placed on the teeth in such a manner as to be removed at the will of the patient. They are recommended, because they may be removed by the patient and the teeth cleaned after each meal. They are not as conspicuous as the fixed appliances, nor are they as efficient. The great disadvantage of their not being securely attached to the teeth is the limit of use and lack of control. A greater amount of pain is caused owing to the constant putting in and taking out of the appliance, which causes undue pressure in the wrong direction, and while it is out, the teeth return to their original position, thus creating unnecessary inflammation. The appliance being constructed, if worn constantly, so as to rest directly upon the lingual surfaces of the teeth and the adjoining tissues, creates a stimulus where none is needed, and an unnecessary pressure on the surfaces. Such an appliance is bulkier, and is less permanent in results.

Fixed appliances have the advantage of firm attachment, both to the anchor teeth and to those that are being moved. Thus appliances can be smaller, and when the force is rightly applied the operator is assured that it will continue in the right direction and the result is bound to be more lasting.

CONCLUSIONS.

Normal occlusion as the basis of orthodontia, has taught that the full complement of teeth is absolutely necessary in order that the teeth may perform their proper function, that extraction of teeth to accomplish the result is unnecessary; yes, even criminal.

Modern orthodontia requires a thorough knowledge of the physiological development of the dental arches and associated structures, the remote as well as the local etiological factors, proper diagnosis, classification, and treatment, based not only upon mechanical principles but physiological as well.

The associated structures are hindered in development where the dental arches are arrested in their development.

Orthodontic treatment should be begun early, in order that the case may be completed by the time the second molars are in proper position as the disturbances occur early in life.

Every child should be given an opportunity to develop normally, permitting marked facial deformities to be corrected with normal functions of nutrition, digestion, and respiration, in order that the whole bodily system may not be interfered with, thus leading to serious results.

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[4]This study of a series of skulls is taken from several articles by Noyes.
[5]Ranney.

COOPERATION OF DENTIST AND ORTHODONTIST*

By J. Lowe Young, D.D.S., New York City.

THE profession of dentistry, while new in comparison with that of medicine, has now reached the stage in its evolution, where, for the best interests of the laity, division of labors and responsibilities must be recognized, as determined many years ago in the older profession. About twenty years ago there were occasional minds so impressed with the necessity of more thorough efforts in the correction of malocclusion of the teeth that they decided to limit their practices to work of this kind. From this beginning, the specialty of orthodontia developed and was the second specialty in dentistry, being antedated only by exodontia (known at that time as the specialty of extracting teeth). Subsequently, developed oral surgery, prosthodontia and periodontia. The thought that orthodontia, like exodontia, was so distinct and separate from other dental operations, that there was little or no overlapping of labors or responsibilities, was responsible for its being among the first of the specialties to be established in dentistry. How true this is we will see later.

That other specialties will develop there is not the slightest doubt, but just in proportion as there is an overlapping of labors and responsibilities, will difficulties be encountered, for it is but human to blame the other fellow where possible. I am convinced that in the near future, there will be those who will give their entire attention and effort to the treatment and filling of root canals. This is made possible by the x-ray, for it would indeed be a bold man who would undertake such a specialty without being able to show in a positive way the results of his labors. That the laity will be better served when such a specialty is established, there is not the slightest doubt, for, the person who is doing any one thing all the time becomes more proficient than he whose attention is divided. As proof of this, consider the many things used in the various walks of life, that are made by artisans of mediocre ability, but fashioned with such ease and dispatch that the cost of production is very small, compared with what it would be if done by one with many other interests. These artisans become specialists in their particular labors and the products from their hands, when compared with those of the average are vastly superior, notwithstanding that the cost of production was less. Who would think in this stage of our civilization to set one man to build a modern house, he to manufacture everything that entered into it, from the raw material? To attempt this would be to set back the wheel of progress for centuries.

The first aim of the true professional man should be to serve his clientele in the best possible manner, regardless of his individual requirements or bank account. But some of us will argue that if we followed this course, we would have nothing to do, as Dr. A. is recognized as the best man in oral surgery and Dr. B. the best man in prosthodontia and so on down the line. The answer is

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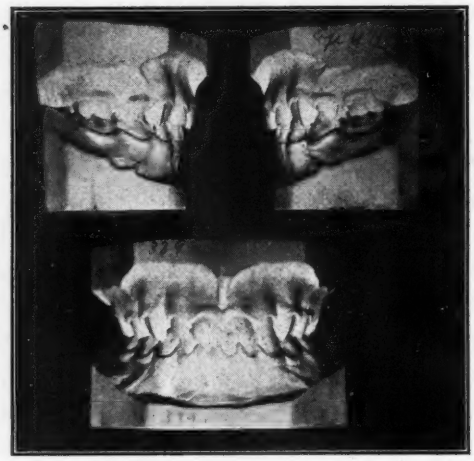

Fig. 1.—Front and side views of normal occlusion of the deciduous teeth, when the second deciduous molars are in full eruption.

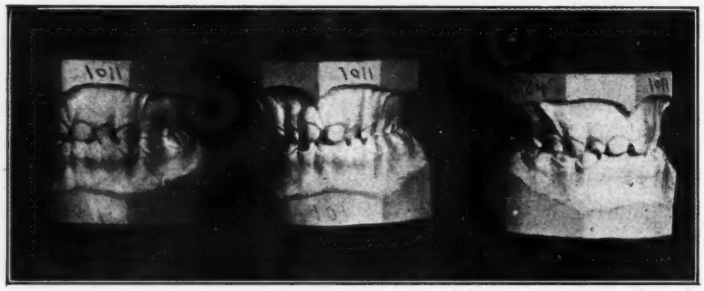

Fig. 2.—Deciduous teeth in malocclusion, the teeth on the upper right side biting lingual to the lower ones.

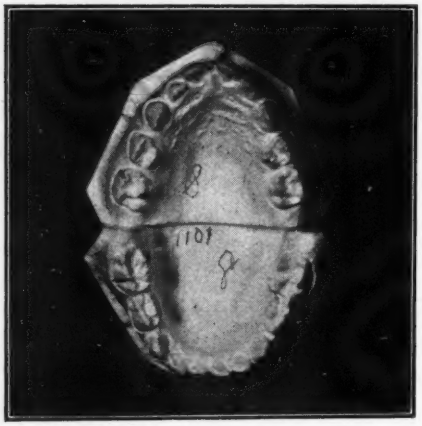

Fig. 3.—Occlusal view of same case, showing that the upper and lower dental arches are practically of the same width in the molar region. This condition never prevails in normal deciduous dental arches.

for us to become as proficient as any one in our community, in some one or as many branches of our profession as possible and then refer to others such work as we do not feel that we can do in accordance with our ideals, for it is only by so doing that a conscientious professional man can continue in practice. How many of us take this view of our profession, and yet how prone would we be to criticize the medical practitioner who would without any previous training or experience undertake an appendectomy, particularly if the operation was on one of our immediate family and did not prove successful?

It does not follow that if the above conditions obtained, all dental opera-

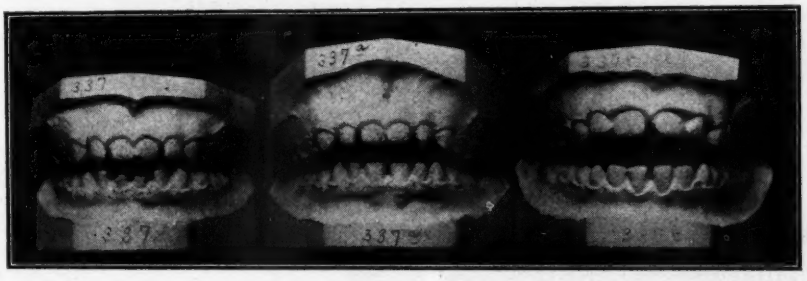

Fig. 4.—Three sets of casts made at five, six and eight years of age respectively. The one on the left shows pronounced spaces between the deciduous teeth. The middle one has the lower permanent centrals erupted with spaces still between them and the approximating deciduous teeth. The one on the right side has all eight permanent incisors in eruption. This took place without any orthodontic treatment, and is Nature's method where normal eruption is not interfered with.

Fig. 5.—How the permanent incisors develop back of, or lingual to the roots of the deciduous one. (Noyes.)

Fig. 6.—How the cuspids and premolars develop in relation to the deciduous ones. (Noyes.)

tions would be satisfactory to the patient, for we differ in ideals as widely as we do in technical ability. But if we are conscientious in our efforts in every operation we undertake, always striving to do it better than the previous one and thus more nearly approach perfection, our ideals will rise in proportion as we improve in our technical ability, and this is the foundation of all professional progress, having always in mind the Golden Rule, "Do unto others as you would have them do unto you."

That we have in every large city in this country one or more specialists in orthodontia and that the number is rapidly increasing, proves conclusively that there are many members of the dental profession who recognize that this work can better be done by the specialist. It might not be amiss for us to consider here why this is so. One teacher of orthodontia has often been heard to proclaim that orthodontia and dentistry are like oil and water and will not mix. But why? Is it that orthodontic operations are more difficult and require a higher order of technical ability or a keener appreciation of the artistic? No. Then why? Orthodontia demands that the malocclusion be corrected. In order for us to correct malocclusion we must have a clear and definite understanding of this ideal condition which we are attempting to restore.

Normal occlusion implies that all the teeth in one jaw are occluding with the teeth in the opposing jaw, so as to furnish the largest area of grinding

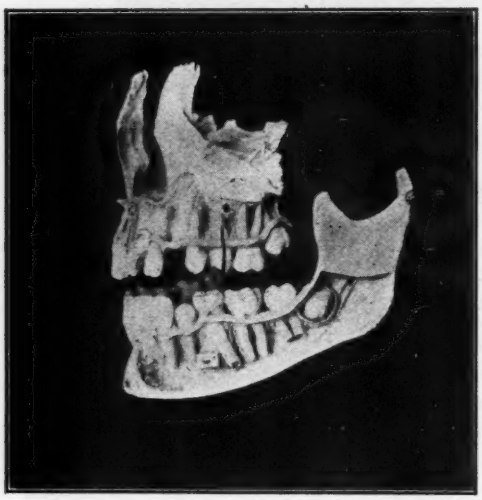

Fig. 7.—The resorption of the roots of the deciduous teeth and the bone surrounding them. As the permanent tooth erupts new bone must develop to support it. (Noyes.)

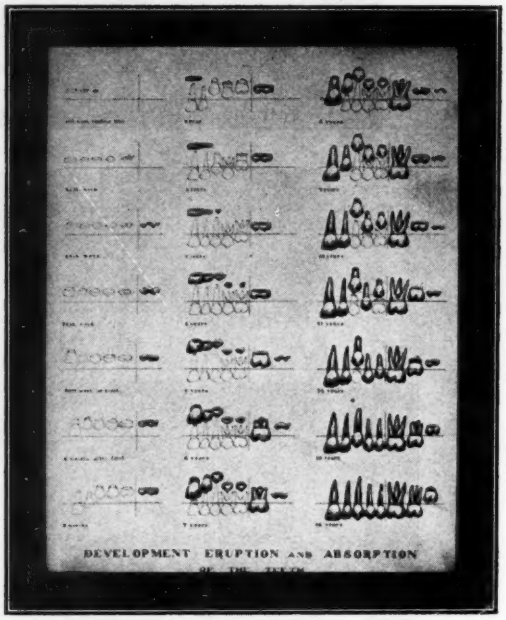

Fig. 8.—A diagrammatic chart, prepared by Dr. Wm. J. Brady, showing development, eruption and resorption of the teeth, that I have found very valuable in explaining to the parents the necessity for early treatment of malocclusion.

surface. The cusps, the inclined planes, and the sulci into which they fit should combine to furnish the owner with the best masticating apparatus, thus forming dental arches which in regard to strength and durability can not otherwise be equaled. The cusps of all the grinding teeth in such arches, interlocking with their antagonists, tend to prevent these teeth from any variation in position either bucco-lingually or mesio-distally. This regularity of the teeth in normal arches is also one of the chief factors in their resistance to decay, and to disease of the surrounding tissues, for the teeth, if they are properly formed, are in a position to be as nearly self-cleansing as possible.

With this conception of normal occlusion, it is apparent that the loss of one tooth or of even one cusp of one tooth, or to be more exact, the loss of

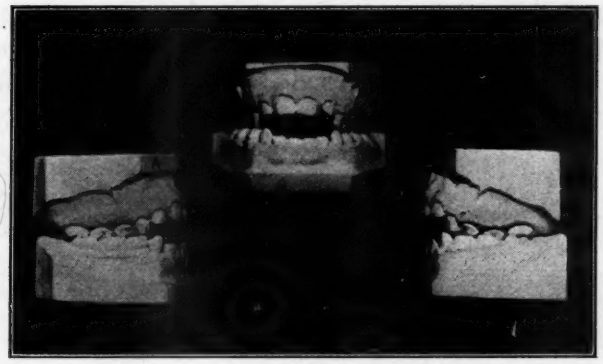

Fig. 9.—The result of constant biting of the tip of the tongue, preventing the eruption of the permanent incisors.

Fig. 10.

Fig. 11.

Figs. 10 and 11.—The result of biting the cheek, forcing the lower molars and premolars of the left side, entirely lingual to those of the upper teeth.

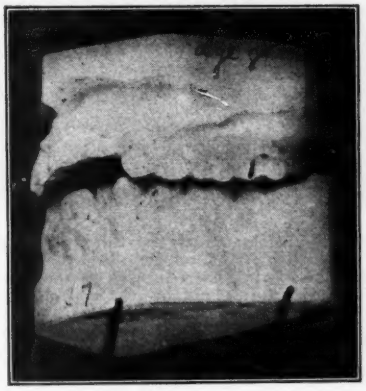

Fig. 12.—Casts of a child of eight years, that has always sucked the left thumb. Observe a slight distal relation in the molar region with a protrusion of the upper left central and lateral. The right side was practically normal.

any portion of the mesio-distal diameter, will destroy to just that degree, both normal structure and normal function. It is also apparent to those who have seriously studied this question that it is of equal importance properly to restore the mesio-distal diameter of the deciduous molars where fillings have been inserted on their proximal surfaces. Hence, if we are properly to correct mal-

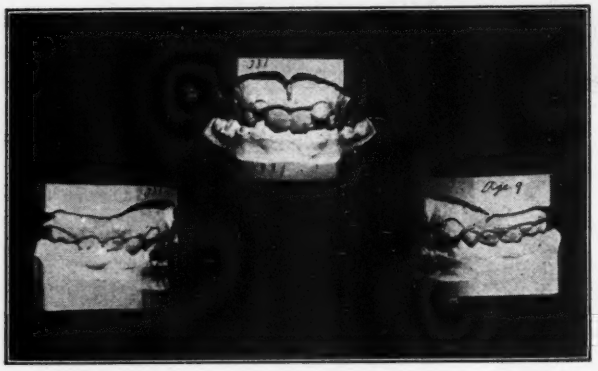

Fig. 13.

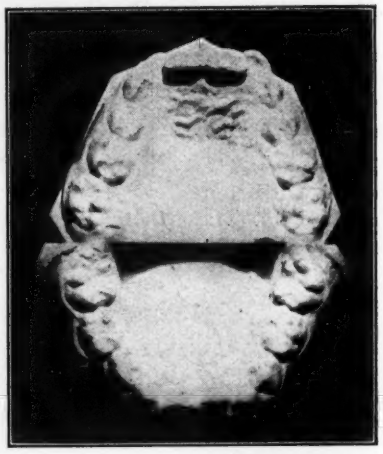

Fig. 14.

Figs. 13 and 14.—Pronounced retrusion of both the upper and lower incisor teeth, the mesial-distal relation of the molars being correct. This condition was caused by contracting the lips.

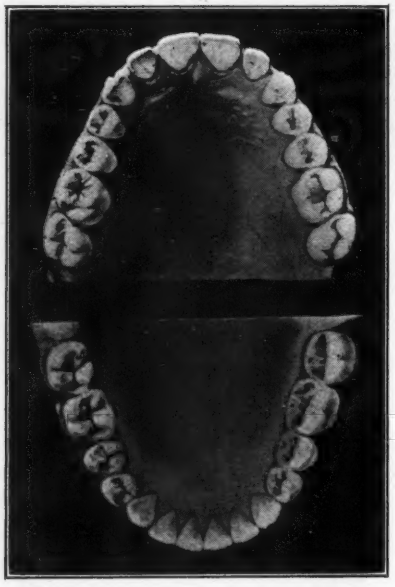

Fig. 15.—Normal shape of the occlusal surfaces of the teeth. Note particularly the marginal ridge on the mesial-distal surfaces of every bicuspid and molar. Where these ridges have not been lost through dental caries, the danger of food particles being forced between the teeth is almost nil. In the restoration of the occlusal surfaces of the teeth with fillings and inlays, it should be the object of every conscientious operator to try to reproduce these marginal ridges.

occlusion, we must have in our mind's eye the form, surfaces, and the positions of the dental organs when normal. The value of proximal contact, the proper occlusion of each cusp, the antagonist of each inclined plane, the size of each

fossa, the shape of each sulcus and the direction of each groove should be known to him who aspires to assist nature to establish the normal.

When teeth are in malocclusion we must in some way be able to figure out from the beginning what must be done in order to put them in their normal posi-

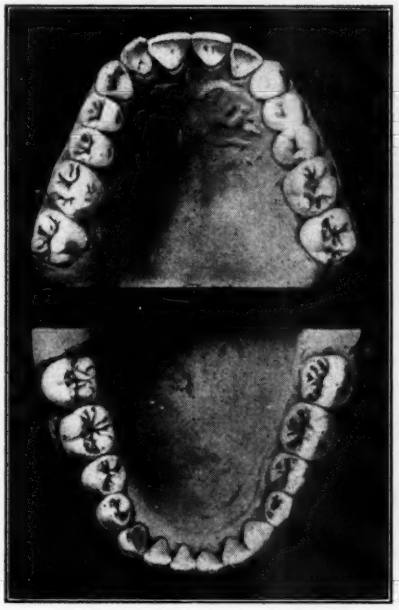

Fig. 16.—A case having ten large gold inlays on the occlusal surfaces of the teeth where a good attempt has been made at anatomical restoration of the marginal ridges.

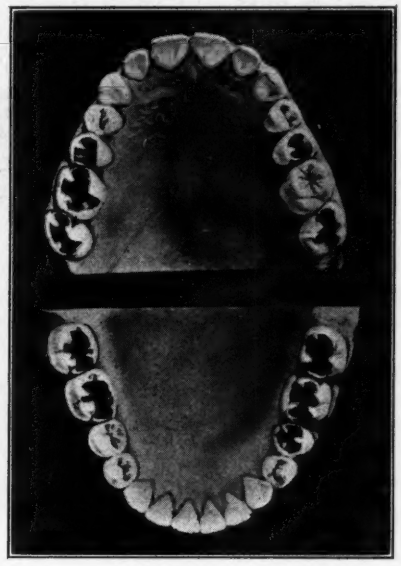

Fig. 17.—The same case with the inlays colored so as readily to be seen.

Fig. 18.—Normal arrangement of the teeth from the buccal view.

tions. This can be done only by procuring a set of accurate plaster impressions in order to make casts of both dental arches, so that we can place the teeth of the arches in the position they now occupy and be able to study them from the lingual as well as from the buccal view. It is not a difficult thing to make a set of casts, I hear someone say. No. But the casts are of little value if we do

not take time to study them and accurately determine just what is necessary to do. This is where the dentist usually makes his first slip. He does not take the time accurately to figure out what he must do with the teeth in malocclusion so as to place them in occlusion.

Orthodontic appliances, to be efficient and comfortable, must be so delicate that there is always a possibility of a break, and it is imperative that this should be remedied at once, for teeth relapse much faster than it is advisable to move them during correction. The busy general practitioner finds it difficult to care

Fig. 19.—Normal arrangement of the bicuspids and molars from the lingual view. This is really the most important aspect from which to view the occlusion of the teeth, and can only be done on the patient by means of casts.

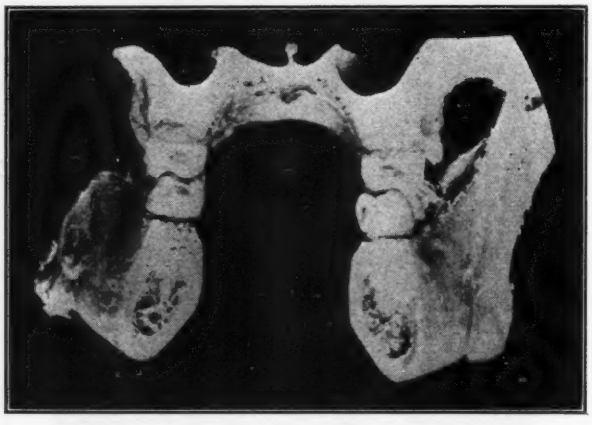

Fig. 20.—Cross section through the molar region. Please note how the buccal cusps of the upper teeth overhang those of the lower molars. Wherever this condition prevails, and the teeth are all present, there is little or no danger of biting the cheeks. (Cryer.)

for these emergencies owing to lack of time with his full list of appointments, and consequently the work is neglected, and possibly forgotten for a time. Slip number two.

It is the duty of the dentist, in referring a case to be corrected, to see to it that the condition of the oral cavity of his patient is what it should be to receive a set of orthodontic appliances, for it must be remembered that in the majority of such cases, appliances of some sort will be required at intervals if not

continually for several years, depending on the magnitude and complications of the case. All carious places should be filled and all roughened or etched enamel surfaces should be thoroughly polished according to oral prophylactic standards, so as to place the teeth in the best possible condition to be kept clean and free from bacterial masses during the orthodontic treatment.

It is the duty of the orthodontist before accepting a patient, to impress upon him, the parent or his guardian, the importance of thorough cleansing of the teeth, and to state clearly and emphatically that any mechanical appliance placed in the mouth renders them more difficult to keep clean, but that if instructions are faithfully followed, it is quite possible to do so. It is also his duty to see to it that his patient has the proper tools with which to work. There are few adults who effectually care for their teeth. One reason of failure is that they work one toothbrush overtime, never giving the bristles a chance to dry and regain their elasticity. A toothbrush used more often than once during the day becomes inefficient. Brushes should be numbered so that the patient can readily select a fresh brush each time he brushes his teeth during the day.

The orthodontist should be willing to state at the beginning that he will assume the responsibility of guarding against any injury to the enamel surface or to the surrounding tissues under cemented bands, provided the patient will report for inspection at stated intervals. This will tend to make him more careful in his technic in fitting and cementing bands. In order to avoid complications he should emphatically state that it is not uncommon for initial cavities on the proximal surfaces of the teeth to be so small that it is impossible to discover them without resorting to a wide separation, particularly on the mesial surface of the first permanent molars. In fact these teeth are so generally affected owing to the very broad contact formed by the second deciduous molars, that it is almost permissible that he mark on his chart with a question mark, all such surfaces that have not been filled. It is obvious that any dentist can readily distinguish the difference between such a cavity and one caused by a loose or ill fitting band, but to the laity, a cavity in a tooth that has been banded is blamed on orthodontia and it is the duty of the dentist to enlighten his patients on such points, if he wishes to cooperate to their advantage.

The age at which patients should be referred to the orthodontist is a mooted question, but it is safe to state that ninety-five per cent of orthodontists will agree that all orthodontic treatment should be completed by the time the permanent teeth that replace the deciduous ones, are in full eruption. Orthodontia then becomes an aiding process, and the final results the best that can possibly be obtained. It is proper to consider at some length why this is so.

The deciduous denture consisting of twenty teeth is complete at the end of the third year, and when normal, the lower teeth are found to be in a definite relation to the upper ones. The incisors both upper and lower are in contact with their approximating neighbors. By the time the first permanent molars are in full eruption, if normal development is not interfered with, there will be a decided change in the size of the deciduous dental arches, resulting in spaces in the deciduous incisor region, both upper and lower. Whenever such spaces fail to appear, it is safe to assume, that there will not be sufficient room in the anterior part of the arches to accommodate the permanent incisors when they erupt, owing

to the fact that these teeth are always considerably larger than the deciduous ones which they replace. This lack of room for the erupting incisors frequently results in what might justly be considered impaction of a number of teeth. That this crowded condition of these teeth is responsible for reflex disturbances which result in baneful manifestations that work to the detriment of the child, is apparent to those who have seriously considered this subject. It is quite common

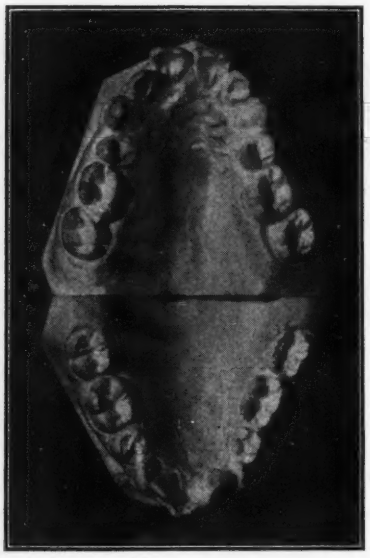

Fig. 21.—Shows that the dental profession is still advocating the extraction of teeth for the correction of malocclusion. Four first bicuspids removed.

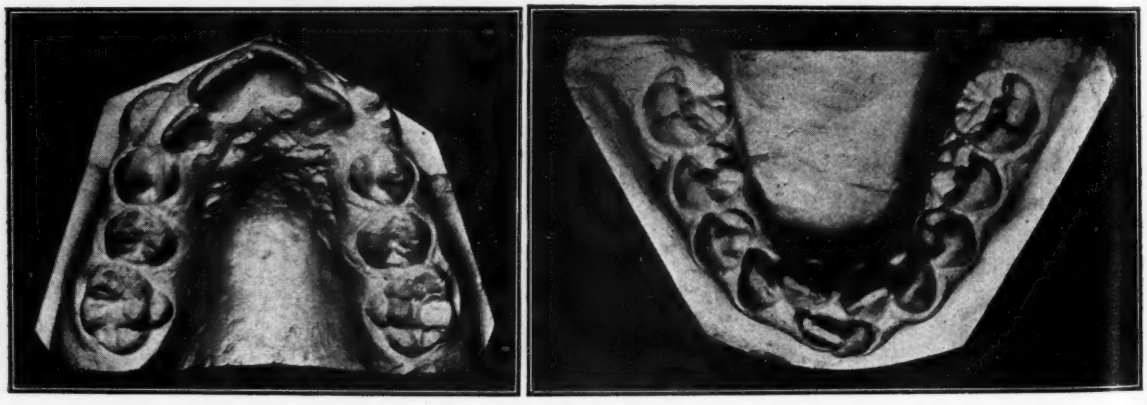

Fig. 22 *A*.—Occlusal view of pronounced case of malocclusion before treatment. See Fig. 22 *B*.

for children at this age to develop habits of various kinds, such as tongue and lip biting, sucking the thumb or finger, biting the nails, biting the cheek, drawing in the lips in various ways, pressing the teeth with the tongue, licking the lips, etc. That these habits are the result of reflex disturbances, it is fair to assume. That such habits influence adversely the positions of the erupting teeth is generally recognized and if persisted in, the correction of the malocclusion is a useless process, as the teeth are certain to relapse as soon as freed from mechanical retainers.

Physicians have occasionally been known to advocate that infants be permitted to suck the thumb, on the ground that it prevents mouth breathing, but all who have encountered such cases will agree that of the two evils the latter is easier to correct.

It therefore becomes the duty of every dentist, as well as that of every physician, if he wishes to cooperate to the fullest extent for the benefit of children

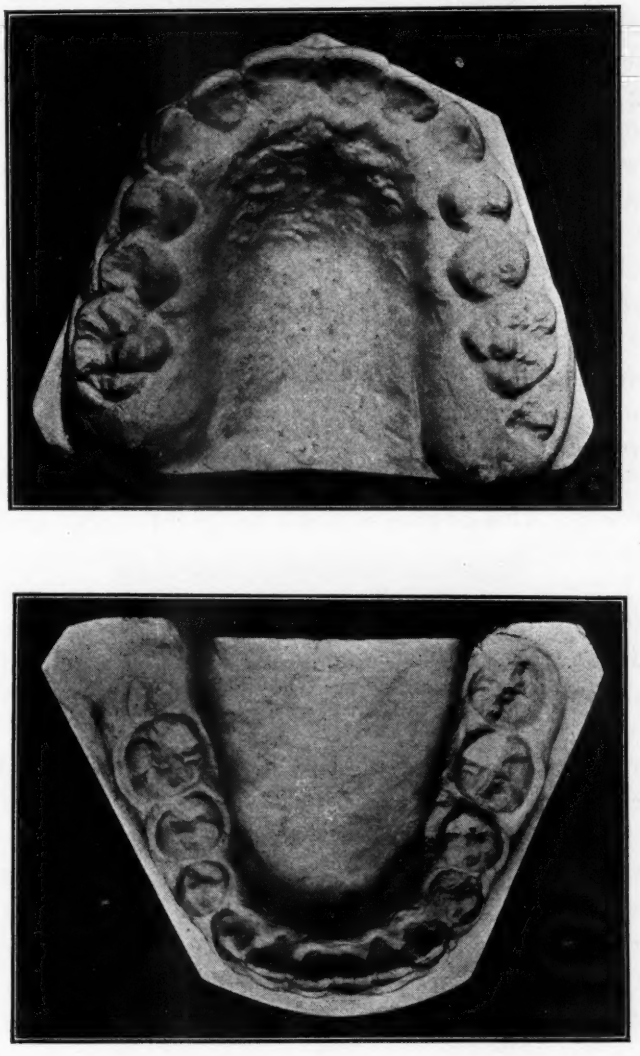

Fig. 22 *B*.—Occlusal views of a pronounced case of malocclusion after treatment. See Fig. 22 *A*. These prove the fallacy of such treatment.

intrusted to his care, to be ever watchful for such manifestations, so that he may use every possible means to break up such habits at the beginning, for the longer these habits are continued, the more difficult they are to overcome. It is a rare thing to find parents who are cognizant of the habits of their child, and when they are, they have not the slightest conception of the baneful effects of such habits. Wherever possible to ascertain the cause of the habit, the cure becomes far more certain.

As the root of the deciduous tooth is resorbed, the bone surrounding it is also resorbed, and as its permanent successor erupts, new bone develops around it to support it. Owing to the fact that the crown of the erupting tooth projects below the gums before the root is fully formed and, also, since there is never any attachment of any kind to the enamel surface of the tooth, it must be obvious that the pressure required to rotate or guide such a tooth into its proper position is very much less than that required to move a tooth in full eruption with the bony socket surrounding it fully formed. Is it not logical that when teeth are guided into their proper positions during the natural eruptive period, so as to place their inclined planes in an harmonious relation with their antagonists, that we are assisting nature to the greatest degree? Is it not fair to assume that teeth so moved are surrounded with bone far more normal in cell activity and structure and therefore better able to withstand invasions of disease, than where resorption of bone has been induced by mechanical means and the teeth held by some device until new bone has developed to sustain them? Who is there that will dare to assert just how long it is necessary to retain teeth that were in full eruption with their bony sockets and surrounding membranes fully developed before the moving process was instituted?

Observation has proved that wherever it is possible to have finished orthodontic treatment by the time the permanent teeth that replace the deciduous ones are in full eruption, the buccal surface of the second permanent molar is far less liable to be attacked by decay than where these teeth are present at the beginning of treatment. This of course is due to the difficulty experienced in properly cleansing these teeth with appliances of any kind attached to the buccal surface of bands on the first permanent molars. It likewise follows that it is safer to band the first permanent molars whenever possible for anchorage for the appliance rather than the second deciduous molars, as any attachment on the buccal surface of bands on these teeth renders the first permanent molars more difficult to keep clean.

Other reasons why it is better that treatment should be finished at this age, are, that children do not object to appliances even if they show; that their tissues possess far greater recuperative powers; that the strain of their school work is lighter and that it is finished prior to puberty, which is usually a strain on both male and female.

In the face of the above how can any conscientious dentist advise parents to delay treatment until all permanent teeth are present?

Close observation will prove that children who erupt deciduous teeth early will usually erupt the permanent ones early, and if the dentist would bear this in mind, he would be the better able to know just when he should refer his patients so as to assure that they will derive the greatest benefit from orthodontic treatment. In all cases of Class II or Class III malocclusion, if treatment can be started prior to the eruption of the first permanent molars, the final results will be found to be more satisfactory to all concerned.

That many parents consult an orthodontist without being referred to their dentist must tend to prove that the members of the laity are far more interested that their children develop normal occlusion than are their dentists, and it is they who should answer why this is so. The great majority of such children are

found to possess pronounced malocclusion and many of their mouths are woefully neglected, both as to oral prophylaxis and filling of initial cavities. Can it be possible that such conditions are due to negligence of the parents? If so, then why are they so anxious about the malocclusion?

Fig. 23.—The occlusal view of a case before treatment. Observe the upper right lateral almost in contact with the bicuspid and the upper left first molar almost in contact with the first bicuspid.

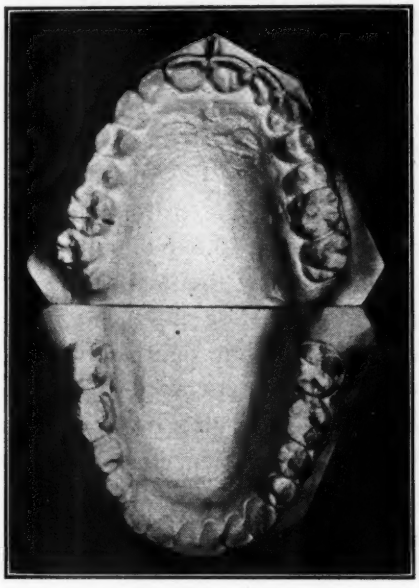

Fig. 24.—Dental arches developed sufficiently to accommodate all of the teeth.

Many of these parents cooperate to the fullest extent during the corrective treatment and when the children are referred to their dentists to have the teeth and mouths put in a proper condition to receive orthodontic appliances, they not infrequently return with the statement that the cavities have all been filled; yet one may find that prophylactic measures have been neglected and often deep cavities in

the occlusal surfaces of the permanent teeth have not been filled. It is obvious that this places the responsibility for such conditions where it belongs.

Apropos to the subject, I quote from a paper by Dr. Grace Rogers Spalding under the title of "Practical Measures of Preventive Dentistry for the Orthodontist," published in the January, 1917, *Dental Items of Interest,* as follows:

"It is difficult for a specialist in our profession to obtain from the general practitioner that complete cooperation which is so essential to success in the ultimate results. There is no specialty of dentistry which is so dependent upon correct dental restorations as orthodontia. In other specialties faulty dental operations are usually recognized before irreparable injury has been done, while in orthodontic cases the shifting of teeth back to their original positions, due to faulty contour, defective contacts and imperfect occlusal restoration is usually so gradual that the occlusion of the teeth may be changed and the purpose of the orthodontist's work entirely defeated before this is discovered."

To offer a solution for this problem is exceedingly difficult, since there will always be dentists and *dentists.* As dental art advances, the technic of the individual operator will naturally improve, but the writer believes that the inevitable solution will eventually be the prevention of all cavities for orthodontic patients during as long a period of time as the patient is under the observation of the orthodontist. After this there should be but little difficulty in preventing caries, for such a patient would probably give his teeth, which would then be in normal or nearly normal occlusion, that intelligent care which alone can and does prevent dental caries. If only the prophylactic specialists and the orthodontists could cooperate to such an extent and together care for a sufficient number of cases to verify conclusions according to our present enlightenment in this direction, the result would be a step forward in preventive dentistry.

In this connection it is deemed advisable to insert two quotations from a paper by your essayist published in the *Dental Items of Interest,* May, 1913, entitled "Restoration of Occlusion by the Casting Process."

"Did it ever occur to you that the orthodontist often works for years to build up this normal occlusion, only to have it pulled down in a day by the ruthless extraction of a single tooth, or by the lack of restoration of cusp contour or proximal contact in making fillings or inlays?

"It would seem, therefore, that the dentist must share the responsibility of the orthodontist in emphasizing the importance of normal occlusion by preserving it at all times, or at least by not destroying it.

"One of the great difficulties experienced by the orthodontist is to retain the mesio-distal relation after it has been established. Very frequently this trouble is due to improper fillings, or inlays, on the occluding surfaces of the teeth, particularly those of the lower first molars. If these restorations can be made so as to reproduce accurately the original shapes of these teeth, and thus permit the large mesio-lingual cusp of the upper first molars properly to seat itself each time the teeth are closed, do you not see what a powerful influence is exerted by the action of the inclined planes of this cusp on the inclined planes of the cusps of the lower first molar, to prevent a return to a mesial or distal malocclusion, and do you not see that to a proportionate degree each reproduction of the normal occlusal surface of a tooth exerts a like helpful influence? Where all restorations

accurately reproduce the original anatomical land-marks, the orthodontist will experience much less difficulty in the retention of such cases."

Occasionally parents who have had their dentist begin treatment of malocclusion for their children, become dissatisfied and consult an orthodontist. In such cases if the appliances are in place, it is the duty of the orthodontist to refer such a patient back to his dentist so that he may remove them, and not till then is the former at liberty to have anything to do with the case. In like manner a dentist should not for any reason remove for his patient, appliances put on by an orthodontist, but should refer them to the man who put them on for removal, and due courtesy should demand that he communicate to the orthodontist, his reason for desiring their removal.

If a patient should decide to change from one orthodontist to another, which he has a perfect right to do, the second orthodontist has no right to consider the case as long as the child is wearing appliances unless he has received permission from the other to proceed with the case.

In all such cases where a patient changes from one practitioner to another for orthodontic treatment, it is the duty of the first operator to deliver to the patient the original casts and photographs if such have been made (provided of course that all financial obligations have been settled), cooperating in every way that will best serve the patient's interest, for it is obvious to every orthodontist that to treat a case without possessing casts of the original positions of the teeth, places him under a handicap, and this is not for the best interest of the patient.

It is not uncommon for dentists, in referring a case of malocclusion, to give the parent the names of several orthodontists, so that he may have a choice. This is a practice we cannot too strongly condemn. It is far better that he should decide who would be the best qualified to suit the individual needs of his particular patient and send him to that person. The patient will be far better satisfied and the dentist much less annoyed, and he will save himself the humiliation of stating to the patient which one of the number he considers the most competent.

ORTHODONTIC MECHANICS: DENTAL ENGINEERING

By Rudolph L. Hanau, Consulting Engineer, Pittsburgh, Pa.

FORCE may be defined as that which causes, or tends to cause, or to destroy, motion.

Resistance is that which is opposite to an acting force. It is equal and opposite to force.

Velocity equals space divided by time.

Work is the overcoming of resistance through a certain distance. It is measured by the product of the resistance into the space through which it is overcome.

Energy, or stored work, is the capacity for performing work. It is measured in the same units as is work.

Power is the rate at which work is done, and is expressed by the quotient of the work divided by the time in which it is done.

With a clear conception of these fundamental definitions of mechanics, it will be convenient to accept the following arbitrary units of measure:

F=Force in grams (g)

R=Resistance in grams (g)

D=Distance in millimeters (mm)

T=Time in weeks (w)

V=Velocity in millimeters per week $V=\frac{D}{T}=\frac{mm}{w}$

E=Work or Energy in millimeter grams $E=F\,D=g\ mm$

P=Power in millimeter grams per week $P=\frac{E}{T}=\frac{F\,D}{T}=\frac{g\ mm}{w}$

A=Area in square millimeters (mm^2)

C=Volume in cubic millimeters (mm^3)

We know that teeth can be moved and have observed that constant gentle forces correctly applied give satisfactory results in orthodontic treatment. It will be assumed in this writing, that we are able to apply forces in predetermined directions. The factors that will concern us in this discussion relative to forces in orthodontics are magnitude, duration of application and the displacement of bone tissue they cause.

Fig. 1 represents a cuspid in side plan view. The dashed outline indicates the position into which the tooth has been moved. The section below the heavy horizontal line in the figure is bone material, the horizontally shaded portion in the drawing indicates the absorbed bone tissue, and the vertically shaded area, regenerated bone tissue. The resistance that the bone material offers to the movement of the tooth (be its cause of physical or physiological origin) must be overcome by forces. By means of devices (appliances, etc.) forces of proper magnitude and direction are introduced.

From a mechano-orthodontic point of view, the tooth may conveniently be divided into two main parts; i.e., the root embedded in the tissue and the crown

which ordinarily projects into space. The forces may be applied on a point, a part of, or the entire surface of either the crown or root as conditions may warrant. Similarly, the equivalent reaction, or the resistance to these forces, may act on a point or area of the crown or root, or both, as the case may be.

An axial bodily movement requiring only one force is illustrated in Fig. 2. A movement requiring at least two forces is shown in Fig. 3.

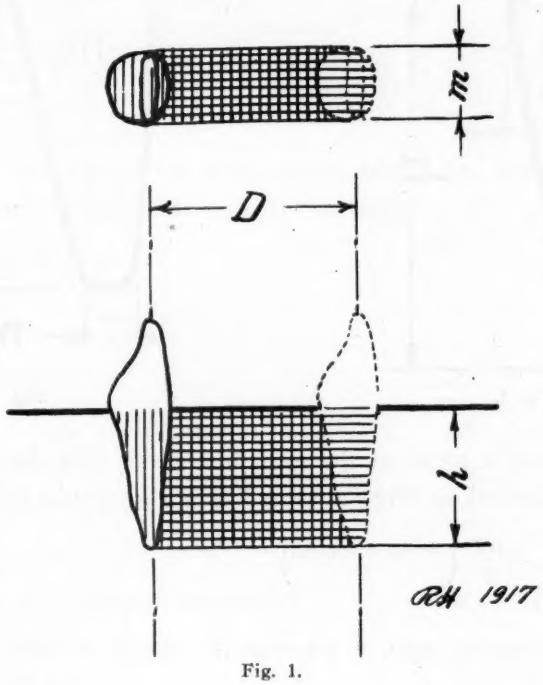

Fig. 1.

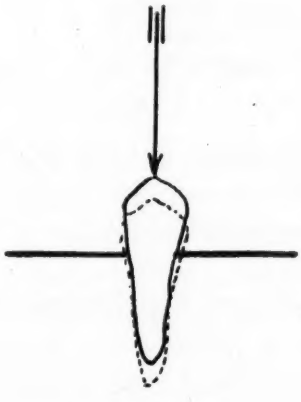

Fig. 2.

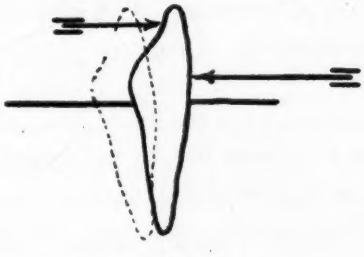

Fig. 3.

Assuming now, that we are familiar with the elements of applied forces and their reaction, it should be evident that the resultant of all applied forces must exceed in magnitude the resultant reaction (resistance), if movement is to take place at all. The resultant of the applied forces is transmitted to the bone at the surface of the root, in fact all around the root, in the case of a commonly malposed tooth. For the sake of simplicity it will be assumed, that the resisting pressure is uniformly distributed on the projected area of the root, that is projected in the direction of movement.

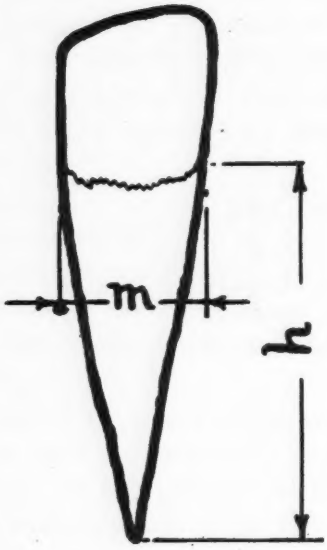

Fig. 4.

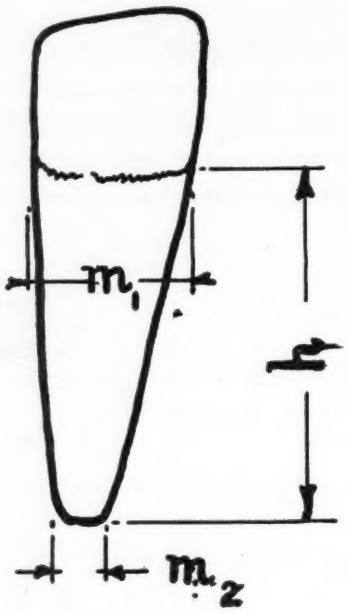

Fig. 5.

Let the width of a tooth at the gum line be m and the length h. Assuming the root to be conical as illustrated in Fig. 4, the projected area is:

$$A = \frac{m\ h}{2} \left(\frac{\text{width} \times \text{length}}{2}\right) \qquad (1)$$

and if we are confronted with a trapeze-like shape of the root (Fig. 5) then the projected area is:

$$A = \frac{(m_1 + m_2)\ h}{2} \qquad (\text{average width} \times \text{length}) \qquad (2)$$

The pressure per unit area (intensity of pressure):

$$f = \frac{F}{A} \qquad \left(\frac{\text{force}}{\text{area}}\right) \qquad (3)$$

If the tooth has to be moved, the distance D (see Fig. 1) then the work to be performed is:

$$E = F\ D = fAD \qquad (4)$$
(work = unit pressure × projected area × distance)

since

$$AD = C \qquad (5)$$
(projected area × distance = volume)

represents the volume of absorbed bone tissue (and also of the regenerated bone tissue), therefore

$$E = fC \qquad (6)$$
(work = unit pressure × volume)

The minimum potential energy that must be contained within the appliance is equivalent to this work.

From equation 6 we have

$$f = \frac{E}{C} \qquad (7)$$

$$\left(\text{unit pressure} = \frac{\text{work}}{\text{volume}}\right)$$

which also represents the work that is necessary to overcome the resistance of absorption and regeneration of one cubic millimeter of bone. It is probably a constant for certain existing conditions.

Taking into consideration the time within which the movement of the tooth is to be accomplished we arrive at a power equation

$$P = \frac{E}{T} \qquad (8)$$

$$\left(\text{power} = \frac{\text{work}}{\text{time}}\right)$$

since $E = F\ D$ (4)

(work = force × distance)

therefore $P = F\frac{D}{T}$ (9)

$$\left(\text{power} = \text{force}\frac{\text{distance}}{\text{time}}\right)$$

since $F = f.A$ from (3)

(force = unit pressure × area)

and $\frac{D}{T} = V$ (10)

$$\left(\frac{\text{distance}}{\text{time}} = \text{velocity}\right)$$

therefore $P = f\ A\ V$ (11)

(power = unit pressure × area × velocity)

We now have an equation for the power necessary to perform an operation which contains the two variable factors f and V, intensity of pressure and velocity of movement, respectively.

Obviously, there exist maximum and minimum values of these factors, within which included regions practice should be confined. It is evident, that very low values, while not harmful, would unnecessarily prolong the duration of treatment. On the other hand, excessively high values are distinctly harmful, and may be the cause of dangerous aggravations.

We will now revert to a brief discussion of the units of measure thus far employed. The units of force, pressure, distance, area and volume are the customary metric units based on the gram and millimeter, and generally employed, in scientific work.

The reasons for the choice of one week as the unit of time, will be obvious. From the units of time and distance we obtain our unit of velocity, v the *millimeter-week,* and will be designated,

$$v = \frac{mm}{w} \qquad (12)$$

The unit of work or energy is that which resists a force of one gram through a distance of one millimeter, and will be designated as *millimeter-gram*

$$w = e = mm\ g \qquad (13)$$

From the above, we obtain the unit of power of our system, the millimeter-gram-week. That is the power required to overcome one gram through one mm. in one week.

For convenience, we will name this unit an "Ant Power" and designate it as

$$1\ AP = \frac{mm\ g}{w} \qquad (14)$$

It may be interesting to note that this unit of power compared with the (metric) horse power is:

$$1\ AP = \frac{1}{45{,}360{,}000{,}000}\ HP$$

It is evident that a given force will cause a certain movement in a certain time. After observations of a particular case, in which an appliance is employed, the velocity which gives the best results may be readily determined. Through comparative analysis (diagnosis) of the recorded data of such observations we will soon be able to classify many seemingly perplexing results.

It is highly important to have a clear conception of force, work, energy, and power in order to prepare proper appliances, especially when the correct arch should only be obtained in successive stages.

From the equation of power (8) $P = \frac{E}{T}$

therefore $E = PT$ (work = power × time) (15)

it may be readily perceived for a specific energy required to perform a definite movement the power varies inversely with the duration of the treatment.

In the equation for power (11) we introduce (10) and arrive at

$$P = \frac{f\ A\ D}{T} \qquad (16)$$

m, 1, D, F and T may be measured or estimated, and

$$f = \frac{F}{A} \quad \text{assumed} \qquad (3)$$

We now have all factors of the equation and P may be readily calculated.

For the sake of clearness, we will take a specific case and apply formulas developed above.

Let us now arbitrarily assume that through experiment we have found that an intensity of pressure of $\frac{1}{9}$ g has proved to be a practical value to employ in moving a cuspid lingually at a rate of ½ $\frac{mm.}{w}$ The width of the tooth measures 9 mm., the length of the root, determined by x-ray, 16 mm. and the distance the tooth must be moved bodily equals 3 mm.

$$V = \tfrac{1}{2}\frac{mm}{w} \text{ (assumed)}$$

$$T = \frac{D}{V} \qquad \text{from (10)}$$

$$T = \frac{3}{\frac{1}{2}} = 6 \text{ weeks}$$

$$A = \frac{mh}{2} \quad \text{assuming the root is conical} \qquad (1)$$

$$A = \frac{9 \times 16}{2} = 72 \text{ mm}^2$$

$$f = \frac{1}{9} \text{ g (assumed)}$$

$$F = A\ f = 72 \cdot \frac{1}{9} = 8 \text{ g} \qquad \text{from (3)}$$

$$P = f\ A \frac{D}{T} \qquad (16)$$

Since $\frac{D}{T} = V$

and $A = \frac{mh}{2}$

therefore $P = f \frac{mh}{2} V$

$$P = \frac{1}{9} \quad \frac{9 \times 16}{2} \quad \cdot\frac{1}{2}$$

$$P = \frac{1 \times 9 \times 16 \times 1}{9 \times 2 \times 2} = 4 \text{ AP}$$

4 AP is, therefore, the power we should expect to use if conditions were as assumed. The tooth must be moved 3 mm., which means we have to apply this power constantly for 6 weeks to move the tooth as has been calculated. We now come to some practical considerations. Say, after one week disturbances (irration of the gum, loosening of the teeth, etc.) have been observed, we may rationally conclude that we have moved the tooth too "fast," that is, the pressure applied was too great. The obvious step would be to measure the actual distance the tooth has moved. Say we find that it has moved 1.6 mm. in one week instead of ½ mm. as intended. That could only have happened because the actual resistance was less than assumed. For the time being we may reasonably assume that the power employed was proportionately excessive, i. e.,

$$\frac{P}{P_1} = \frac{V}{V_1} = \frac{1.6}{\frac{1}{2}} = 3.2 \qquad (17)$$

i.e., $P = 3.2\ P_1$

and instead of 4 AP,

$$P_1 = \frac{P}{3.2} = \frac{4}{3.2} = 1.25 \text{ AP should have been applied.}$$

These calculations are based on the theory that tooth movement is directly proportioned to the pressure applied, an assumption which, although rational, may not be correct. The correct relation can only be determined through sufficient experimental data. It has also been assumed that the force is constant which is not absolutely correct.

Using now

$$P = 1.25\ AP$$

let us retrace our calculations to obtain F_1 the new force that may be applied.

$$P_1 = \frac{F_1 D}{T} \qquad (9)$$

$$P_1 = F_1 V. \qquad (18)$$

$$1.25 = \tfrac{1}{2} F$$

$$F = 1.25 \times 2$$

$$F = 2.5\ g$$

instead of F = 8 g, which is the force that acted when we applied a power of 3.2 AP.

If the observed results, after the application of the newly found force, are satisfactory, then we continue the treatment or we complete our treatment in stages, as the case may require. Should, however, unfavorable symptoms persist, then it will be necessary to still further modify conditions, precisely as outlined.

As far as the theoretical mechanics involved is concerned, the subject may be reduced to simple mathematics. The determination of practical constants in the equations will be a matter of many observations of carefully conducted experiments.

The practical application of orthodontic mechanics, the *elements* of which have been outlined, must obviously be preceded by accurate, authoritative determination of the experimental factors which follow.

Velocity of tooth movements.

Intensity of pressure.

Time relation between absorption and regeneration of bone tissue.

Relative resistance of different teeth in a given mouth.

Resistance and action of bone tissue *at different depths.*

The universal application of dental engineering principles in the practice of orthodontia will doubtless bring a new era in this science. I shall not attempt to enumerate the possible advantages. It would obviously be superfluous to present a brief in favor of a rational method as a substitute for no method.

Where structures were once built "not to fall down" they are today built "to stand up." That phrase aptly compares the engineering of today and yesterday. It is hoped that this phrase may soon be applied in speaking of the advancement of orthodontia.

A STUDY OF SOME DENTAL ANOMALIES*

By B. Frank Gray, D.D.S., Colorado Springs, Colo.

THE orthodontist is dealing every day with dental anomalies. I take it any dental irregularity, or peculiarity, for that matter, may properly be called an "anomaly." However, in this paper I wish a restricted meaning to apply to the word "anomaly."

We observe cases where certain teeth are almost wholly transposed in their relative positions. For instance, a cuspid tooth may be much more nearly in the normal position of the lateral incisor, and the lateral more nearly in the normal position of the cuspid, than either tooth may be to its own proper position. What shall we do in treating such cases? I do not believe the "farthest way round is always the nearest way home."

I have in mind a patient I treated two or three years ago, where the maxillary right cuspid was really very near the normal position of the lateral incisor. Likewise, the lateral was approximately in the normal place of the cuspid. I felt more than justified in moving the cuspid tooth to the normal place of the lateral, and the lateral incisor was allowed to occupy the place of the cuspid. But all cuspid teeth do not make good laterals! In the case cited, after reducing the already rather blunt cusp and shaping the tooth a bit with stones, I assure you it looked very well indeed. To have placed those teeth where they really belonged would have entailed a strenuous operation, and its justification in the case of this patient of fourteen years of age would have been most questionable.

I recall an orthodontist showing me models, a few years ago, of a rather similar anomaly. The transposition of the cuspid and lateral was almost complete. Yet he assured me he could, and expected to move the cuspid tooth around the lateral, ploughing through a rather thin strip of process. I confess it seemed almost foolhardy.

The principal question that comes to me with reference to this immediate class of anomalies, is this: May we not make too great a sacrifice in endeavoring to establish normal (normal to the letter, I mean) relations of the teeth in these extreme transpositions? In the absence of the models, I may not be fully understood as to the extreme degree of the transposition of the teeth in the case mentioned.

We are finding more and more, I think, the congenital absence of permanent teeth. I never think of allowing a deciduous tooth to be extracted without a radiographic examination, unless its successor is absolutely assured. The cases multiply wherein the permanent teeth are missing, and certainly a deciduous tooth may be made to do important service for some considerable time in such a case.

I call your attention to the case of a boy of about seven years of age. In the absence of the mandibular second deciduous molar, I made x-ray pictures,

*Read before the Pacific Coast Society of Orthodontists, February 12, 1917.

which revealed there was no second bicuspid. Then I radiographed the opposite side, though the deciduous second molar *was* present. The second bicuspid was also absent on that side. (Fig. 1.) There is one principal point in this case about which I would like to have as many opinions as possible. I advised the parents it would be best to remove the remaining right second deciduous molar, and move forward both first permanent molars the width of the missing bicuspid teeth, believing the second permanent molar would in due course, erupt forward, thus avoiding the necessity of bridge work later on, and, incidentally, removing an obstacle to the normal anterior development of the lower arch,—leastways saving the necessity of a retaining appliance to hold open the space of the missing teeth.

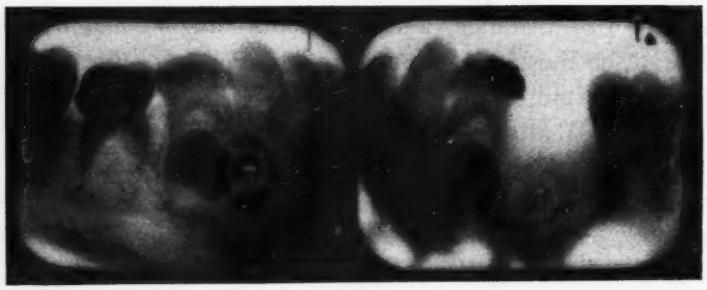

Fig. 1.

Fig. 2.

Fig. 3.

Another case which has interested me is that of a boy twelve or thirteen years of age. You will note by the illustrations (Figs. 2 and 3) that the deciduous cuspids are in place, although the radiographs show their roots are absorbed quite fully. The permanent cuspids are wholly developed and fully erupted. In the congenital absence of both bicuspids on either side, the permanent cuspid occupies approximately the position of the second bicuspid, and it

will be noted the cuspid teeth are almost in contact with the first permanent molar teeth.

On the left side of the mouth the deciduous cuspid is not so fully absorbed as on the right. In the lower arch (Fig. 3) the boy has no second bicuspids. Thus six permanent teeth are congenitally absent.

It would be most interesting, I think, to receive suggestions from the orthodontists, as to the best method of treating such a case, as well as to have their ideas as to methods of supplying the missing teeth.

Fig. 4.

Fig. 5.

Fig. 6.

I wonder how many specialists in orthodontia create dental irregularities? I am sure many of us have some experiences of that sort in the course of our work. In the illustration (Fig. 4) you will note the mandibular second permanent molar has taken a decidedly wrong position. So far as I can guess, it is due to the rather rapid forward movement of the first molar,—the second molar following the channel of least resistance—the furrow ploughed by the forward moving first molar. Note the third molar seems to be taking a somewhat similar inclination.

Again it will be interesting, I think, to consider the practical means for correcting such a malposition, although *prevention* may be of the first importance. Should I be correct as to the cause of the condition shown, then may we not need to be a bit on the alert in this matter? Probably my last suggestion as to the cause, had best been first; i. e., was the erupting second molar retarded by contact with an ill-fitting band on the first molar?

I am still confronted, among dentists, with the contention that third molars exert an unfavorable influence on the occlusion of the teeth in some cases; that although irregularly placed teeth are corrected, the erupting third molars distort the occlusion very seriously. That these teeth do exert a tremendous force on adjoining teeth I think was attested in the case of which I show radiographs (Fig. 5). Because of the serious character of the impactions, the dentist recommended the extraction of the second molars (certain distressing nervous affections having been in evidence). One of the extracted second molars was shown me by the exodontist, and there was pointed out to me by the family dentist, a *decided groove* in the distal surface of the tooth at a point corresponding with the point of contact with the impacted third molar. Beyond any reasonable doubt, in this case the third molar *had* created the latter anomalous condition, and these impacted teeth were the cause of the patient's suffering. After the removal of the second molars, the symptoms complained of by the patient disappeared.

Aside from the possibility of distortion of occlusion, it is, of course, extremely interesting to note and study the series of nerve reflexes due to these impactions. A study of the nerve supply, the ganglia, etc., of course, explains how these conditions may be brought about. Distressing mental ailments are not infrequently caused by such anomalies. Such has been the testimony of the late Dr. Upson, of Cleveland, of Drs. Cryer and Mershon, of Philadelphia, and of a great many others.

Since this paper was read, the case represented in Fig. 6 came under my observation. The patient, a woman of approximately thirty-five years of age, had gone the round of the medical and dental profession, seeking relief from a distressing neuralgia, extending over a long period of time. A radiographic examination revealed the impacted upper first molar, as shown. Doubtless here lies the cause of the persistent neuralgias from which this patient has suffered. The tooth has not yet been removed because a surgical procedure of this importance is not entered into by the average person without some trepidation.

In conclusion, I am impressed more and more with the immense field of interest and profit, in the study of the class of anomalies I have referred to. We cannot, in justice to our patients or ourselves, pass these things by lightly. And until some standard of treatment has been proved quite wholly correct, I feel there is a large field for study, experimentation, and, I trust, an opportunity for benefiting humanity.

DISCUSSION.

Dr. McCoy.—I remember the first case I had in orthodontic practice was one in which there was a transposition of the upper lateral and cuspid on the right side. In the enthusiasm of my youth I unhesitatingly undertook the treatment of this case, and before I got through with it I had some very discouraging times. At the end of nineteen months, however, I succeeded in accomplishing the movement of these two teeth without the death

of the pulp of either of them. In all such cases, if they should come to me now, unless there was some very, very important reason why the positions of those teeth should be changed, I think I would hesitate seriously in doing it, just as I would hesitate to rotate a bicuspid which was completely rotated, as they are sometimes found.

Dr. Gray mentioned the influence of the developing third molars, and their relation to malocclusion of the lower teeth. I think these teeth should be watched very closely at the time when their eruption is going on, and if we will take a little precaution we can prevent any trouble which might result from them. I have made it a rule for several years, in as many cases as possible of this class, when I think it is about time for these teeth to commence to make themselves apparent, to make radiographs, and if I find they are starting upon their journey toward complete eruption I construct a retainer by banding the lower cuspids and connecting them with a lingual wire, and thus give a bit of added support to the lower arch in the belief that I will prevent the third molars from doing any harm. I am sure that the results justify me in going to this extra trouble.

In many cases, at the very first sign of any crowding of the lower incisors, or crowding between the lower cuspids, I have made radiographs, and without a single exception the radiographs have shown the lower third molars in the process of development or eruption, and they do not necessarily have to be impacted either, in order to cause this pressure.

I think in the case of missing lower second bicuspids, that unless there is some unusual condition prevailing, we should by all means consider seriously the dragging of the lower first molar forward and filling the space, and letting the lower second molar erupt and fill up the remaining space, and depend on the third molars to make up this deficiency, rather than subject the patient to bridge work for a lifetime. It is a matter of debate, but I think I would personally rather have one less tooth if I could have the molars in good contact with the lower first bicuspid, and depend on the teeth posterior to make up for the deficient grinding surface rather than be subjected to bridgework.

Dr. Suggett.—I find I am drifting into the same state of mind as Dr. Gray and Dr. McCoy in those cases. I used to unhesitatingly open up the spaces for missing laterals and bicuspids, but in the last few years, since hearing some of our best operators express their opinion that their best root canal work has often proved a failure, and they realize they have to cut down teeth for bridge work, I hesitate to bridge in those spaces. In several cases referred to me from the East, I have found the men there are doing the same thing—beginning to close up the spaces where they used to open them up. Since the x-ray has come into such general use, some of the best root canal work in a few years shows up very badly, and most of the best operators are having less faith in the permanence of that work than they had before, so it behooves us to side-step bridge work every time we have an opportunity to do so. It is easier to bring those teeth forward since we have the new form of attachments than it was before. Now, with these direct attachments we can slowly close up most of those spaces very nicely, and we have a more healthy mouth through this method. The mother of one of my patients has as beautiful an arch—at conversational distance—as you could imagine, and both laterals are missing. The cuspids are moved forward, and the effect appears as perfect, as far as shape of the arch is concerned, as most any case one could see. I have seen a number of others that have done the same way, and I have tried to pattern after that in some later cases, with fairly good success.

Dr. Ketcham.—In regard to the last films Dr. Gray showed on the screen—x-rays of temporary teeth about to be shed (lower temporary molars with the cusps holding the space open), the second temporary molar was lost through decay several years before it should have been lost. In this boy the masticating efficiency of his teeth was greatly reduced: the patient was poorly nourished, etc. The object of putting the cusp on was to get occlusion with the upper teeth—masticating efficiency for that side of his mouth. To the anchorage band on the molar was attached a loop upon the mesial surface of the band. The first temporary molar was banded, then a cusp struck up to fill the space between the first temporary molar and the first permanent molar, and the cusp was soldered directly to the first temporary molar band, and toward the posterior end of the cusp on the under portion, was soldered a spur resting in the loop upon the molar band, permitting of the movement of the anchorage tooth, and it gave the boy occlusion. The space would have been held by the arch wire, but with the improved masticating efficiency of his teeth, the spreading of his arches and improved breathing, he made a marked gain in health.

The question where a premolar is absent, of whether to permit the space to close

(and the lower second premolar is the tooth most commonly absent in my experience) is important. I think an orthodontist who does not systematically check up by means of the x-ray, every temporary tooth in the mouth when a patient comes to him—unless he can feel or see the succeeding tooth—is guilty of gross carelessness, because there is about one child out of ten, in my experience, in whom one or more of the permanent teeth are absent. So it is not unusual in checking up these children, to find that some of the permanent teeth are absent, and we should know that when we start treatment of the case so all measures should be taken to save those temporary teeth—as they should not be lost under such circumstances.

The question of permitting the space to close is really a grave question. We know if we permit the space to close and the antagonizing teeth are all present, we will have malocclusion of the grinding surfaces of those teeth, and we will have a greatly reduced efficiency of mastication of food. I reported a case some years ago of subdivision of Division 2 of Class II. A lower lateral was extracted because it erupted lingual to normal. I first started to make space for the missing lateral, and I was moving the lower teeth on the right side, forward as well. It occurred to me, why not move all the teeth on that side forward further than normal the width of one cusp. So I did that and closed the space. I moved everything around toward the left until the right lower bicuspid occupied the space which the cuspid had formerly occupied, and the cuspid was in the space of the lateral. I left the molars too far forward the width of a cusp in relation to the upper molars. A study of the patient's face when I started treatment, showed the muscles on the left side of his face were better developed than the muscles on the right side of the face, where the molars were in distal occlusion. Immediately after treating, no noticeable difference between the two sides of the face was in evidence. In two, five and ten years after treatment the muscles on the left side of the face showed better development than upon the right. The patient is trying to use both sides of his mouth in the mastication of food, but the left side is much better than the right side. The teeth have settled so that the interdigitation of the cusps is as perfect as possible in such a case. The cusps are long and well locked. But you can see the efficiency is so reduced that really it is a serious question what to do in these cases—whether to let the patient have bridges later on in life, or close up the spaces, with the resulting poor mastication of food.

Dr. Dewey.—The question of treating cases where teeth are missing—termed "compromise treatment" by Lourie, is something to which we should pay more attention. In the case described by Dr. Ketcham, I wonder if it was a question of inefficiency or a question of habit as to the mastication? If you study anatomical forms of the teeth, there is a difference between a lower first and lower second molar, and you do not get an anatomical occlusion by moving the first molar forward; but I think it is better than resorting to an artificial tooth. The occlusion finally becomes worn by masticating stress, and you have a more efficient apparatus than by any artificial substitute.

Another thing I have observed is, in those cases where the first molar is moved forward and the second follows it, they almost invariably have a large lower third molar. Whether it would have been large anyway, is a question. The third molar on the side of the missing tooth is always the larger. It seems at first glance, one would explain the question of the growth of the third molar to a larger size, by the absence of a tooth on that side. The calcification of the third molar is delayed very much. There is calcification of the crown, but not a fusing together of those cusps. Until those cusps become fused together it is possible for the crown to become increased in size.

As stated before, I have observed in a number of cases that the third molars are larger on the side of the missing tooth. However, there is no way of proving it would not have been larger if the tooth had not been missing.

In the treatment of transposed teeth, such as the shifting of the canines and laterals, I think if the canine takes the position where the lateral should be, the best thing to do is to leave it there and not try to shift it, because the long treatment required to move this tooth entirely around, is very liable to subject the patient to nervous shock, the result of which we do not know; and in reality we are working for the benefit of our patient more than we are for ideal results.

Regarding the case shown by Dr. Gray, where the second molar was tipped forward —as well as the tipping of third molars—some of you may remember about two years ago we published a paper by Lourie on the treatment of such cases, in which he had used "the ligature jack." He has a number of results where he has straightened up apparently

hopeless third molars, thus avoiding their extraction, etc. The principle of the ligature jack is very beautiful, because of the small amount of force it exerts and the ideal position in which that force is applied. Mitchell, of Indianapolis, has applied it to the expansion of the arch—using the ligature jack in the canine region—with very decided results. It works beautifully. In these cases of missing teeth I think we should treat them from the standpoint of efficiency rather than from the standpoint of the ideal results.

Dr. Solley.—I have a case on hand at present that has demanded considerable thought. The two lower centrals and the upper right lateral are missing. The question is whether to draw the lower lateral incisors over to the center and swing in cuspids, or whether or not I will get sufficient strength from the lower laterals to swing a slight bridge in there. Am I right in drawing the two lower laterals to the center to get additional strength for the bridge work?

Dr. Dunn.—I have always taken the stand that it is far better to close all spaces in the case of missing teeth, than to supply the teeth by artificial means—wherever it is possible to make the necessary tooth movements. Because of that stand I have had quite a number of experiences. Some have proved rather sad, and others have been very gratifying. I found, of course, in moving the first molar into the space of the second premolar—the ease of the operation depended largely on whether the movement was in the upper or lower arch—much more skill being required to move the lower first molar forward than the upper first molar. My first experience was with a patient where I needed to move the second molar forward to take the place of the first molar—lost by extraction. That experience was not very gratifying. I carried them part way. The final result I am not able to state at this time. I have now a patient—a boy who was originally a patient of Hawley, of Washington—where the results of carrying the second molars forward was very good indeed, and the work was quite easy of accomplishment, even though there was little cooperation on the part of the patient. I have another patient—a girl of twelve years of age—where if I had it to do over again, I certainly would not undertake it. I have finally carried the second molars forward, but it has now covered a period of two years to accomplish that movement, and I doubt if I was warranted in expending that amount of energy and time on such a piece of work.

As to moving teeth into spaces where a number of teeth are missing, thus trying to fill those spaces, I believe it to be wholly inadvisable. I have had several cases of that kind, and perhaps due to a lack of cooperation of the patient the time spent has been extended, and the result has not been satisfactory. I think it would be much better to supply those spaces by artificial means.

I have also had the experience of moving cuspids around laterals, one in particular I recall, which caused me to reach the same decision as Dr. McCoy—"Never again!" I think those movements are a mistake, and that we should never attempt to do such things.

As to the tipping of the teeth, of which Dr. Gray has spoken, I believe in the treatment of Class III cases, in the lower—if we are not especially careful we will impact the second or third molars. Where the teeth are not erupted I think that is commonly done. The occluding surface of the impacted molar lies up against the distal surface of the tooth immediately in front of it. In Class II cases where we hurry our treatment I think many times the second or third molars are impacted as stated. The force is too great against the anchor tooth—carrying it distally. As to the case Dr. Gray cites, where he believes the dragging of the first molar forward rapidly caused the tipping of the second molar, I, too, believe the too rapid movement was the cause, the second molar not having an opportunity to right itself.

I have a case of my own at the present time (it really should come under Class 1, but it might have come under a Subdivision of Division 2, Class II) where the right first molar was moved distally to make room for the second premolar. In that movement the second molar was forced lingually, in toward the tongue. The result has been I have had a most difficult time because the relation of the third molar had to be overcome. The extraction of the third molar is impossible at this time.

Dr. Gray.—I am much gratified at the discussion of these subjects by so many of the members. While I will not occupy further time, I wish to say I regard the points brought out as being of great practical worth. The experience of orthodontists who have struggled with these problems for years, is certainly worthy of careful consideration. Almost any tooth movement is possible with our knowledge and skill at this time—but there are some tooth movements which may be wholly unfair to our patients.

DEPARTMENT OF
DENTAL AND ORAL RADIOGRAPHY

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THE DENTAL RADIOGRAM—ITS VALUE, ITS ABUSE, AND SOME POINTS IN ITS INTERPRETATION*

BY LELAND E. CARTER, D.D.S., SAN FRANCISCO, CALIF.

IN offering this paper, I do not wish to convey the impression that I claim a superior knowledge of the science of dental radiography, and I sincerely hope that any statements I may make will not be considered an attempt to arraign the profession of which I have the honor of being a member. My conclusions in relation to dental radiography are the result of considerable thought, study, and practical experience in this particular line of work, and I offer them in the hope that I may contribute a share toward a better general understanding of the possibilities and limitations of the x-ray as applied to dental surgery. My object is not only to impress upon you the value of this particular diagnostic aid, and point out to you the opportunities we are overlooking by neglecting to give it the attention it deserves, but also to call attention to the abuse to which it has been subjected, and by explaining some of the elementary points in the interpretation of radiograms, prove the utter impossibility of taking full advantage of dental radiography under existing conditions.

There seems to be a great difference of opinion among writers and speakers on the subject as to the terminology which should be used when mentioning that phenomenon in physics commonly called the "x-ray." As William Conrad Roentgen was responsible for this most wonderful contribution to science, and whereas it is most desirable that a standard nomenclature be adopted, the use of his name when referring to his discovery has been suggested as a most fitting and commendable practice. Our own Horace Wells discovered anesthesia, but we do not call it "Wellsology," so I can not see why we should make an exception relative to the x-ray. Professor Roentgen called his discovery the x-ray because he did not know exactly what he had discovered and inasmuch as there still exists a doubt as to the exact nature of this phenomenon, why not continue to call it the x-ray? Aside from the fact that it is the modern tendency to do away with the discoverer's name in the construction of the terminology applicable to a scientific discovery, *roentgenology* is a difficult name to pronounce. Radiogram is without doubt the logical word when referring to an x-ray negative. It is derived from the combination of a Latin and Greek word meaning *ray,* and *that which is written.* So we have radiogram,—that which

*Read before the Alumni Society of the Dewey School of Orthodontia, Chicago, Ill., March, 1917.

is written with the ray. And so by the science of word building we have constructed a nomenclature as follows, in part:

X-ray:—A phenomenon in physics discovered by William Conrad Roentgen.
Radiogram:—The shadow picture written with the x-ray.
Radiograph:—(A verb.) To make a radiogram.
Radiography:—The practice of producing the radiogram.

For our own use we simply prefix the word *dental.*

Raper has constructed the word *radiodontia,* which answers our purpose even better than anything offered before. We have our *orthodontia* and several other *dontias,* so there is no reason why we should not use the word radiodontia.

For the benefit of those who may not be familiar with the terminology sanctioned by the American Roentgen Ray Society, I have here added their nomenclature:

Roentgen:—Pronounced rent-gen.
Roentgen ray:—A phenomenon in physics discovered by William Conrad Roentgen.
Roentgenology:—The study and practice of the Roentgen ray as it applies to medicine and surgery.
Roentgenogram:—The shadow picture produced by the roentgen ray on a sensitized plate or film.
Roentgenograph:—(A verb.) To make a roentgenogram.

Just imagine bouncing those words off your tongue for half an hour!

To mention the many cases in which dental radiography can be used to advantage in a modern dental practice would simply be a resume of nearly the entire list of dental operations. I do not believe the radiogram is infallible, but I am firmly convinced that if the possibilities of the x-ray, as applied to dentistry, are carefully studied and scientifically employed, dental surgery will advance more rapidly and gain recognition more quickly than could be made possible by any other means. Aside from its value as an efficient aid in all classes of professional work, it has been a potent factor in raising our professional horizon; it is probably one of the strongest links between the dental and the medical professions, and if properly taken advantage of, will do a great deal toward bringing about a more intimate relationship between the two professions, the ultimate realization of which would be a great benefit to humanity. It is not an uncommon thing to find the physician referring his patient to a dental surgeon for a complete examination of the oral cavity. The progressive internist is beginning to realize that he must call upon the dental profession more frequently for help in combating many of the ills to which the human body is heir. The wide-awake dental practitioner sees in this practice the dawn of a new era in his profession and is preparing himself to meet the new conditions.

There is no doubt that the pulpless tooth problem is one of the most serious with which the dental profession has ever been confronted. Its solution would undoubtedly fulfill the prediction made by an eminent member of the medical profession, that the next great step in preventative medicine would come from the dental profession. How soon this prediction will be carried into effect is

hard to conjecture, but—*when it is, the x-ray will be found intimately associated with the means of its accomplishment.*

Recent discoveries have furnished abundant and sufficient proof to show that our indifference to science has been our greatest stumbling block. As a profession we have given too much time to art and not enough to the scientific side of our calling. Heretofore most of the progress in dentistry has been on a mechanical plane, and while our advance in this respect is worthy of great commendation, our very concentration on this phase of our work has made it more difficult for us to rise to the demands now being made upon us. For some time past we have been educating the school children in oral hygiene and we must take into consideration that before long we will have a more enlightened public to deal with. It would indeed be very embarrassing to find ourselves struggling to answer some of the questions the children of the present are going to ask us in the future. My observation has taught me that the majority of the dental profession are ever ready to avail themselves of any means to improve their service, but they are interested in inverse ratio to the amount of midnight oil which must be burned in order to master its successful application.

The truth of this statement is evidenced by the fact that almost anyone in or out of the dental profession who has evolved an elaborate technic covering any branch of our work, finds little difficulty in persuading many dental practitioners to accept his methods: we are prone to jump to the conclusion that these *educators* have worked out the scientific factors governing their particular line of work, when, as a matter of fact, they have, in many instances, simply jumped to conclusions themselves.

Many instances could be cited to show that we are prone to jump to conclusions, but I shall not take time to mention them in this paper. I have simply digressed for a moment from my subject in order that I might bring to your attention more forcibly the fact that we must become thinkers if we wish to keep abreast of the times. We must discourage the habit of jumping to conclusions and demand that these self-appointed educators teach us some good sound science instead of simply giving us an exhibition of their technic.

Following the rather confused condition in which the dental profession found itself when the relationship between foci of infection in the oral cavity and certain systemic diseases was finally accepted as a fact, radiography was introduced as the possible means of solving our problems. We again jumped to a conclusion and the burden was placed on the x-ray. Laymen who were quick to see the commercial possibilities of its rather spectacular features—in the absence of a law governing its application—entered our profession as specialists, after a few weeks' preparation, and offered us all the advantages of the x-ray without the necessity of burdening ourselves with the multiplicity of complications attending its successful application. It is a lamentable fact that with as valuable a diagnostic aid as the x-ray at our disposal, we relegated its application to nonprofessional men who were not prepared to realize the responsibility of the position into which they had thrust themselves. Having obtained a smattering of anatomy and pathology, they attempted to diagnose our cases. We were told that a dark area at the apex of a tooth or anywhere in the radiogram was

an abscess, a granuloma, a cyst or anything that happened to look like a similar case in their textbook. Histories, clinical examinations, or other means of diagnosis were not taken into consideration because these untrained operators were not qualified to intelligently handle or comprehend the necessity of resorting to other diagnostic means, and the majority of dental practitioners, being totally unfamiliar with radiographic technic, were led to believe that the radiogram was infallible. As a result of this invasion of our profession by these untrained laymen who became dental radiographers and diagnosticians virtually over night, thousands of teeth were needlessly sacrificed, sometimes even against the advice of the dental surgeon. Whether we have done more harm than good by this wholesale extraction of teeth is a matter for argument, but the fact still remains that we jumped to a conclusion relative to the application of the x-ray, and we have been, and still are, jumping to conclusions in our interpretations of radiograms.

Another disagreeable feature connected with the present status of dental radiography is the fact that these lay operators not only produce and interpret radiograms for the dental profession, but they perform the same services for the medical profession. I made the statement a few moments since that the x-ray was probably one of the strongest links between the dental and the medical professions, and if properly taken advantage of, would do a great deal toward bringing about a more intimate relationship between the two professions. The practice of allowing the physician to be advised by unqualified dental diagnosticians results in a misunderstanding between the two professions, and tends to separate them rather than to bring about a closer relationship. The internist wishing to determine whether or not there are foci of infection in the oral cavity sends his patient to a dental radiographer and receives a beautiful set of radiograms in due time, showing several so-called *"rarefied areas,"* and a diagnosis of the case. The physician, being unfamiliar with the pathology of the oral cavity and the interpretation of dental radiograms, takes the dental radiographer's diagnosis to be correct and orders the teeth extracted.

Untrained and unethical laymen have done a great deal of harm by insisting upon placing themselves on a level—or above—the dental practitioner in the matter of diagnosis of dental conditions. The fact that these men obtain business from the physician, as well as the dental surgeon, is sufficient to warrant our giving this problem our serious consideration. If members of the medical profession are to be advised relative to oral conditions, this advice should come from a dental surgeon and not from someone who knows less about the oral cavity than the physician himself. We have trouble enough without having some misinformed internist blaming us for an infection which never existed.

Many medical men admit that they are not capable of diagnosing dental diseases and the medical radiologist, as a rule, does not solicit patients from the dental profession, as he claims that he can not give as satisfactory a service as one specially trained in dental science.

Having had no experience in dental practice, but having been placed upon the plane of a professional man by their patients, many laymen can not resist the temptation to pose as specialists, with a knowledge above the ordinary, and

advise the patients as to what should be done to *"cure"* the condition they have so *"miraculously"* discovered. The dental surgeon can not always agree with the findings of the so-called specialist, and as a consequence is given the *credit* by his patient of not knowing his business.

The ability to interpret a dental radiogram is an accomplishment worthy of our serious thought. There is no royal road to success in this particular line of work. To acquire proficiency requires as strict attention to detail as obtains in other departments of dental surgery. One must have a thorough knowledge of the topographical and internal anatomy of the head, a thorough understanding of the technic of producing the radiogram and be familiar with the radiographic appearance of the parts involved under normal conditions.

It is not safe to assume that a radiogram will show a pathological condition. It merely shows a deviation from the normal which may be of pathological or physiological origin. We should never hazard a diagnosis from radiographic findings alone, but should supplement them by other diagnostic means. We can not determine from a radiogram the specific contents of a cavity or resorbed area. It is impossible to differentiate between the pulp, pus, cotton or air in a root canal, so unless the root canal is filled with some substance opaque to the rays, we are unable to determine from x-ray evidence whether or not the tooth is vital. Likewise, a dark area at the apex of a tooth can not be positively diagnosed an abscess, even if it is markedly circumscribed. It may be one of several pathological conditions, the true nature of which we can not determine from the radiogram. The x-ray is distinctly a diagnostic aid, and, when used as such, is capable of being of great assistance to us; but if allowed to be regarded as a positive means of diagnosis, is liable to do much harm.

Before saying more about interpretation I wish to show an old familiar picture (Fig. 1) and call attention particularly to the cancellated structure, the mandibular canal, and the mental foramen. It is well to keep this picture in mind when interpreting a radiogram of this region. You will notice there is no regularity in the cancellated tissue, large and small medullary spaces are scattered here and there and are of all sizes and shapes. It is possible to mistake one of these large medullary spaces for a so-called "rarefied area." The mandibular canal passes downward and forward from the mandibular foramen; its course is near the outer cortical portion and along the lower border of the cancellated tissue passing beneath the foramen to its termination near the roots of the incisor teeth. The mental foramen is the outlet of a branch tube given off slightly anterior to and passing backward to the foramen. This is almost invariably the rule and is shown in this slide. The fact that the tube to the mental foramen is in the form of a recurrent canal often leads those not familiar with this fact to a wrong conclusion relative to the shadow cast in a radiogram.

We must always bear in mind that the radiogram is not a photograph. It is simply a shadowgraphic representation of the varying resistance offered to the x-ray. Different tissues, metallic fillings and the like are represented by a characteristic shadow, governed by the resistance they offer; the less resistance, the darker the shadow.

In the next illustration (Fig. 2) we have metallic fillings, cement and gutta percha showing white. The next darker shade is represented by the enamel.

Then we find the shadow getting still darker as the resistance becomes less, as represented by the roots of the teeth. Next comes the bone, represented by the varying shadows according to its thickness. The white line which borders the roots is the alveolar wall and the dark line between it and the tooth is the peridental membrane. The pulp itself, offering no appreciable resistance, is

Fig. 1. (After Cryer.)

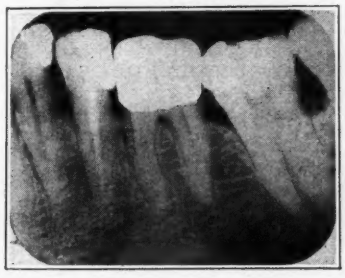

Fig. 2.

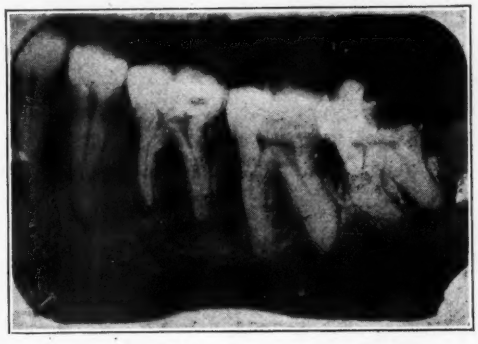

Fig. 3.

Fig. 4. (After Cryer.)

not shown, but the canal is outlined by a dark shadow. Absence of tissue is characterized by a very dark shadow. It is well to keep in mind the dark line and the white line bordering the roots of the teeth. If there is a dark area at the apex of a tooth and these lines are not broken but show distinctly, we have good reason to believe that the apex is not involved.

Fig. 3 illustrates a radiogram of the inferior molars and premolars. It is

a good example of the different degrees of resistance offered to the ray on account of the varying thickness of this particular bone, the mandible, and shows a large area between the first and second premolars—the mental foramen. Incidentally, this slide shows deposits of serumnal calculus at the gingival border.

Fig. 4 (from Cryer) shows sections made at different points from a mandible which was not quite normal in its density. A radiogram of such a mandible would be particularly hard to interpret.

One of the most perplexing features with which we have to deal in the interpretation of radiograms, is the superimposition of shadows. This makes a

Fig. 5. (After Cryer.)

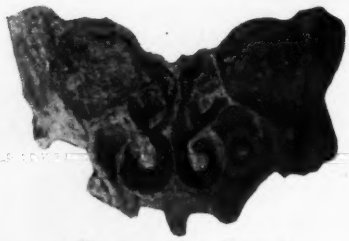

Fig. 6. (After Cryer.)

Fig. 7. (After Cryer.)

Fig. 8. (After Cryer.)

negative of the area involving the superior molars exceedingly difficult to interpret on account of the superimposed shadow of the antrum.

Fig. 5 (from Cryer) showing a transverse section of a typical skull, illustrates the position of the first molar in relation to the antrum. The fact that we meet so many variations in the size and the shape of antrum and nasal cavity increases the difficulty of obtaining satisfactory results in these particular regions.

Fig. 6 (from Cryer) shows lack of symmetry in the nasal and maxillary sinuses. It is always necessary to make several exposures of this area as it is almost impossible to make one exposure giving the correct root lengths. As

the buccal roots are superimposed over the lingual roots, we must vary the angle.

Fig. 7 is an illustration taken from the under surface of a typical skull. The prominence of the zygoma makes the molars difficult to radiograph in this type of head on account of the superimposed shadows. The type shown in Fig. 8 is very different in all respects.

It is not generally understood that a radiogram of the superior incisors is one of the most difficult to interpret with which we have to deal. The radiogram shown on the next slide (Fig. 9) emphasizes the fact that a diagnosis should never be made from radiographic findings alone. Here we have apparently a large circumscribed area involving the superior central incisors. The patient's turbinate bones had been removed some time previous to the radiographic examination. The six anterior teeth responded to the electric test. Percussion and transillumination gave no evidence of the existence of an area as shown in the radiogram. A wire placed upon the nose at the junction of the nasal cartilage

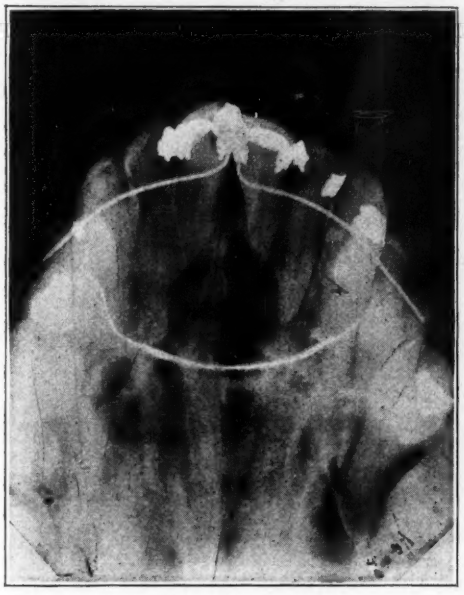

Fig. 9.

Fig. 10.

and the inferior border of the nasal bones outlines the posterior border of the shadow as shown on the radiogram. The position of the film and the direction of the rays are shown in Fig. 10. With this description I will leave the case in your hands.

The title of this paper covering three important phases of dental radiography —any one of which is worthy of a separate discussion—precludes dealing with them all in detail except in a very lengthy paper. I have simply mentioned some of the important points in the three phases, as I view them. If I have succeeded in bringing to your attention some new points which will be of value to you, I feel greatly gratified and fully compensated for the time given to the preparation of this paper.

METHOD FOR DENTAL STEREOROENTGENOGRAPHY*

By Henri Letord, D.D.S., and Charles G. Lunan, El Paso, Texas.

DENTAL roentgenography has generally been confined to the use of single roentgenograms as in multiple films or x-ray plates. Until recently the writers have been accustomed to making plate records of the upper and lower jaws, supplementing these, when necessary, by dental film records. No argument is necessary to convince one that the stereoroentgenogram is superior to a single plate in clearing up doubtful points.

Using as a model the old type of "frontal sinus" board, we had built a duplicate with a shallow tunnel underneath to accommodate a 6½ by 8½ inch plate. (Figs. 1 and 2.) These illustrations show more plainly than any written description the groove where the plate is inserted and the rectangle marked on the surface directly overlying the plate. Care is taken to shake the plates into similar positions in the envelope before inserting them.

Fig 1

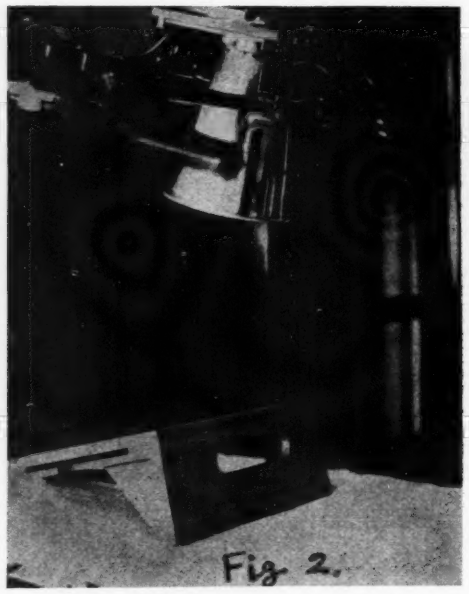

Fig 2.

The surface of the board measures 15½ inches in length and 11 inches in width. The thickness is 1¼ inches. The bark piece measures 11 inches by 3½ inches. The total length of the slot measures 7¼ inches, and begins 2 inches from the back of the instrument. There is a notch on the under surface to make it easy to withdraw the plates. The slot is one quarter of an inch in width.

We employ a tube stand of the Kelly model. Any good tube stand will answer, provided it permits easy manipulation of the tube carriage for stereoroentgenography.

The technic is very simple: First, make an exposure; second, change the exposed plate for a second plate, move the tube 2½ inches, and continue with the second exposure. It is important to see that the long edge of the rectangle, indicating position of plate, is parallel to the long supporting bars of the tube stand.

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EDITORIALS

The System of Trade Journals

THE efforts that are being made by various men in the dental profession at the present time to give dentistry dental literature that is not controlled by dental supply houses has led some men to claim that the fight is being made against dental editors and not against trade journalism. This is not true, as the fight is not with dental editors, but with the system under which they work. We are personally acquainted with the majority of dental editors, and know them to be men of high ideals. They have done a great good for dentistry, but we claim they could have done a greater good if they had worked under another system. There has probably been no force or influence brought to bear directly upon the editors of trade dental journals, for the dental supply houses have been too wise to attempt anything like that, nevertheless, the editor must understand the workings of the trade journal, the principles for which it was founded, and that his influence will be

limited. Anyone versed with the workings of the commercial ideas of the trade journals and the houses which publish them must know that when there has been a conflict of interests between the commercial side of the journal and the professional side, the editor who is working for the commercial house has been subservient to the system, and if he could not endorse the proposition, he has at least kept still. We believe that the editors who are employed by the system are men with high ideals and have done a great amount of good; but we also believe that they could have done a greater amount of good if they had not been employed by the system. If these editors had been working for a journal controlled by the profession, or by themselves, we believe they would have accomplished a greater amount of good for dentistry than they have. Their limits have not been their lack of ability, but the fault of their surroundings.

We often pride ourselves that American dentistry is of the highest type. This may be true in regard to some of the mechanical phases of dentistry, but as related to the dental journals, it is not true. Compare the leading trade journals of America today with the *British Dental Journal.* The *British Dental Journal* is the dental journal of the British Dental Association and it is far superior to any trade journal in existence in this country. The journal is published bimonthly and has a professional standing and dignity that is not possessed by anything published by trade houses in this country. We do not claim that the editorial staff of the *British Dental Journal* is any more capable than is the editorial staff of some of the trade journals of this country, but we do know that they are working in a more professional atmosphere and as a result of it they are able to produce a journal which is far superior to anything produced by the system in this country. The *British Dental Journal,* being conducted in the interest of the profession, contains articles which are of interest to the dental profession.

Often in the case of trade journals, we find that papers describing articles sold by the publishers are given preference over strictly scientific papers. Trade journals will publish papers which are purely scientific, but that they do not give scientific papers the same prominence that they give to commercial papers can be proved by going through the back files of any trade journal. Papers which deal with the commercial side of dentistry are given a more prominent place in trade journals and are better illustrated than are articles which are purely scientific. In going through the back files of one of the prominent trade journals which is published by a house given to the manufacturing of dental appliances, including regulating appliances, we need only to select two papers. One of the papers was a scientific essay which dealt with certain etiological factors of malocclusion. The paper was not given as prominent a place in the journal as it deserved and the illustrations were poorly made. It may have been only an accident, as we know all papers can not be given a prominent place in the journal; however, the same journal published a paper describing a regulating appliance which was manufactured by the dental house publishing the journal, and the paper was placed in a promiment position in the journal and the illustrations were beautifully made. Perhaps this was an accident too; however, we will follow the workings of the system of trade journals further. This paper describing this particular regulating appliance was mentioned in the advertising pages of the journal in the same issue. This may have been another accident. Later this paper was published as a re-

print and sent broadcast to the profession with a price list of the particular appliance. Another accident perhaps, but we believe it was the working of the system. Did they make reprints of the purely scientific paper dealing with important etiological factors in the production of malocclusion and send it broadcast to the profession in the interest of dentistry? They did *not*. The system does not work that way.

We realize that with large trade journals, they probably have more papers than they can publish, but it is, nevertheless, queer that the papers which deal with scientific subjects should be the ones most often refused space in the journal. That such papers are refused space is proved by the fact that we have published within the last two years two papers which have been in the hands of an editor of a trade journal and they were not published. The refusal of the publication of these papers, or at least the holding of them so long that the authors recalled them, again shows the slowness with which trade journals conclude to publish papers that do not assist the commercial side of their business. These papers to which we refer were part of the proceedings of a certain orthodontic society which had published, and which still publishes, its transactions in the above mentioned trade journal. Rather, they publish such parts of the transactions as the trade journal sees fit to publish. However, the society must like that kind of treatment from the system, for it has again given the transactions to the trade journal. If a journal publishes the transactions of a society, we do not believe it is the duty of the editor of the trade journal to select such essays as he likes and publish them and refuse to publish the remainder. It is almost unbelievable the amount of assumption of authority which some societies will endure at the hands of the system.

We believe that the majority of dental societies are made up of men who have high ideals. However, they often allow their ideals to suffer as the result of the working of the system as was the case in the society referred to. The society, as a whole, probably does not realize to what an extent it is playing into the hands of the system by allowing the trade journal to take liberties with its proceedings and transactions, beside assisting the trade house to carry on its commercial enterprises. We have referred to a certain trade journal, which is published by a dental trade house which manufactures a certain regulating appliance, and which has commercialized the essays published in the journal by referring to the essay in the advertisements and later, by mailing the essay to the dental profession accompanied by a price list of the appliance described in the essay, as being the working of the system of commercialism. We have mentioned that this same commercial journal has been the official organ of a certain orthodontic society and that only such papers as met with the entire approval of the system were published, which plan we claim is not to the greatest good of the science of orthodontia.

Also, we claim that this particular orthodontic society is placing itself unconsciously in the hands of the system by this plan and producing a chain of circumstances which are difficult to explain to a scientific group of men who are not versed with the powers of commercial journalism. For instance, the commercial journal has featured and made an advertisement out of an essay which described a certain regulating appliance, patented by a certain man; the orthodontic so-

ciety is composed of men who are graduates of a school which was founded by the same man who patented the regulating appliance; in other words, the system manufactured the appliance, used the pages of the journal to advertise the patented appliance, and published the transactions of the society which is composed of men who are graduates of the school which bears the same name as the commercial appliance. Not a very pleasing professional and scientific combination. We believe the society is in bad company.

We do not believe that any undue influence has been brought to bear upon the members of the society, for we know most of them personally; but they have unconsciously fallen into the hands of a commercial system and are allowing the transactions of their society to further the interests of a commercial house. We are only mentioning these things to show what a wonderful hold commercial journalism has on the dental profession and how dental societies seem to be entirely subservient to the wish of the system.

The medical profession had a similar fight with trade journalism a few years ago, and has made great strides since the elimination of journals published by supply houses, leaving only those controlled by societies and professional men, published by publishing houses whose business it is to disseminate scientific knowledge and not to sell drugs and surgical supplies. How long will the dental profession play into the hands of the system of commercial journalism?

A Need for the Regulation of Specialists

A FEW years ago when the dental profession was not divided into specialists and the general dentist was supposed to fill all the needs found in the dental field, the question of the regulation of the various specialties was not even considered or even thought of. With the advent of men who began to specialize in orthodontia and a little later those who began specializing in oral prophylaxis and the treatment of pyorrhea, some began to realize that it would be only a few years until the dental profession would be divided up into a number of specialties. That this realization has come true is shown by the fact that we now have a number of distinct specialties in the dental profession. As the public is beginning to recognize these specialties, there is need for some legislative action to control specialization.

The first thing to decide is who has the privilege of specializing in certain subjects. In other words, the question might be asked, "What constitutes a specialist?" From the medico-legal aspect the specialist can be considered a man who shows particular skill in his particular work; one who possesses more than the average ability, and one who is expected to accomplish results which are beyond the average. While this is true of a number of men posing as specialists, of a large number it is not true. Unfortunately at the present time the public has very little means of knowing who is qualified to treat certain conditions or who is qualified to pose as a specialist or who has the particular knowledge of the subject, who is above the average and who can be expected to accomplish more than average results.

The dental profession itself is more or less able to decide on the qualifications

of a man specializing, because they should have some knowledge of the training he has received before he posed as a specialist. Taking orthodontia, for example, which is one of the earliest specialties of dentistry, the dental profession has been inclined to classify men who have specialized in orthodontia according to those who have taken post-graduate instruction and those who have not. They have also been classified to a certain extent by the membership which they have held in orthodontic societies, although a membership in an orthodontic society does not necessarily indicate a man's qualifications to practice a specialty neither does it indicate he has taken special post-graduate work. For instance, in the oldest society of orthodontists in the United States, in fact in the world, namely, the American Society of Orthodontists, all that is necessary to gain membership is to indicate that one is practicing orthodontia as a specialty. The Board of Censors has no power or right to disqualify him regardless of his ability to practice orthodontia as a specialty, regardless of his training before beginning to specialize. In other words, a man needs no qualifications, so far as ability is concerned, to become a member of the American Society of Orthodontists. He need not necessarily, have taken a recognized course of instruction in orthodontia, but all that is required of him is to have a nice card printed, and send out announcements stating the fact that he is specializing. In this manner he can become a member of the American Society of Orthodontists, after which he can use his membership as a recommendation to his patients, saying he is a member of the American Society of Orthodontists, and, therefore, a specialist because only specialists can belong to that society. In other words, the membership of the American Society of Orthodontists is open to the man who decides to specialize overnight. This is proved by the fact that there are a number of men in the society who have never indicated any special qualification as regards orthodontia. There are men in the American Society of Orthodontists as members who are considered "orthodontic jokes" among members of the dental profession in their community. As example of that we know of a man who is a member in the American Society of Orthodontists who was practicing in a small country town; believing orthodontia presented a future, he left the small country town and went to a larger town and sent out announcements that he would specialize in orthodontia. He applied for membership in the American Society of Orthodontists, and was admitted. However, the dental profession of the community have not taken his effort so kindly, and consequently have refused to recognize him as a specialist and he is not receiving the support of the dental profession which he would have received had he qualified along legitimate lines to practice orthodontia. No one ever thought he was interested in orthodontia. Before he decided to specialize he had never read nor discussed a paper upon the subject, and, so far as anyone is able to find out, he never treated a case of malocclusion. Nevertheless, the American Society of Orthodontists has placed its stamp of approval on him by admitting him as a member.

We know several other instances where men have taken up the practice of orthodontia as a specialty simply because they had been attracted to the field by the seemingly large amount of work that could be done along orthodontic lines, the large number of malocclusions that are to be treated, and by the supposition that all orthodontists are making money. Only recently we were approached by a

man of a small country town who desired to take a special course in orthodontia. He was informed regarding the next session of the school, the number of weeks required to complete the course, and that by no means would he be given a short special course of three or four days as he desired. He argued that he did not have sufficient time to spend eight weeks in taking a course, which everyone knows is short enough, that he must practice orthodontia immediately. When asked in regard to his qualifications, he said he had been reading the dental journals, had bought one or two textbooks on the subject, and had treated two or three cases of malocclusion in his practice. However, he was determined to be a specialist, and as a result he located in a larger city, sent out his announcements, and now poses as a full-fledged orthodontist. He will next apply for membership in the American Society of Orthodontists, and, as he is limiting his practice to orthodontia, he, of course, can qualify, and afterwards will probably use the fact that he is a member of the American Society of Orthodontists as an indication that he is a real specialist. Facing these facts, it is evident that there should be some means of designating who are specialists; there should be some means provided by the Board of Censors whereby it may be able to reject men who do not possess the qualifications of orthodontic specialists.

We know of a great many men doing orthodontia in general practice who are much better qualified to be specialists; who are much more entitled to membership in the American Society of Orthodontists than some of the "overnight specialists" who are now members. We could name a number of men whom we would rather trust with the treating of malocclusions of our friends or our friends' children than we would a number of specialists. We know a great many men in general dentistry who have spent years in studying orthodontia, who have taken special post-graduate courses in the orthodontic schools, and who are recognized by the dental profession in their community as having more than the average knowledge on orthodontic subjects. These men would be a credit to orthodontia as a specialty and they would also be a credit to any orthodontic society in the world because of their interest and mature judgment and their desire to practice orthodontia as a science.

However, orthodontia is not the only science or specialty of dentistry that is handicapped by the man who decides to specialize overnight. Oral prophylaxis, or the treatment of pyorrhea, as it is called, is also handicapped by men who, seeing a large field for such a specialty, decide to specialize overnight and their greatest qualification is the fitting up of a "swell" office, the purchasing of a compressed air outfit and a large number of instruments. They have absolutely no knowledge of pathological conditions; they are not able to recognize or differentiate pathological conditions of the oral cavity, but they are of the opinion that a finely equipped office, with nice lettering upon the door, and a long white gown will establish them in the eyes of the public as oral prophylaxis specialists and enable them to get larger fees than they would if not rated as specialists. Unfortunately the public has no way of designating or knowing when a man is qualified to specialize, therefore the necessity or the need of some action by the dental profession or by state boards which will put the stamp of approval on a man who has the ability to practice these specialties and which will eliminate those who have not the ability.

Prosthesis, or prosthodontia, has been similarly handicapped because there is

no means of preventing a man from specializing in those lines if he so desires. However, with these subjects it has not been so bad as with oral prophylaxis because a prosthodontist is compelled to deliver the goods before he gets very far with the public. With this kind of work, more than any other in dentistry, the public is able to judge results and consequently the specialists of prosthesis will have to be better qualified to exist in a community than the specialists in the branches above mentioned.

We might also refer to the man who is specializing in extraction and who is another individual who is compelled to produce results or his practice will not last very long. However, with the extracting specialist there is great danger of a large amount of harm being done before the public is aware of the man's inability and probably again there is no one of the dental specialties which the public has been able to recognize in so short a time; no dental specialty in which the public is able to place their stamp of approval upon a man so soon as the man who is engaged in extracting as a specialty. Of course, the extracting specialists, as a rule, and to a certain extent, assumes a legal obligation that is not assumed by the others mentioned, owing to the fact that he is compelled to use a large number of anesthetics, and, as a result, if he is not qualified in the administration of anesthetics, his mistakes may be more serious to the patient who consults him than would be the mistakes of other specialists.

When we come to radiography, we reach a specialty of dentistry which needs more regulation than probably any other because radiography is the only specialty in which it is possible for anyone, regardless of his training, to enter. As a result of this we have posing today as dental radiographers a large number of men who have absolutely no training along dental lines and whose qualifications for the practice of radiography is a little knowledge of electricity and photography. We will admit that a knowledge of electricity in the practice of the radiograph is a necessity, but we also claim that the x-ray specialist should have some knowledge of anatomical and pathological conditions; some knowledge of infection so as to avoid infection of one patient from another; some knowledge of clinical facts so that he can base his diagnosis of the radiograph upon clinical facts, as well as upon the appearance of the shadows. There should be some provision made to regulate the practice of all of these specialties, especially radiography. A regrettable condition has been brought about in the dental profession through the practice of radiography not being regulated. We know of men who prefer to send their patients to an x-ray laboratory—to a man who has no knowledge of dentistry—than to an intelligent x-ray specialist who is able to base the diagnosis upon the clinical evidence as well as upon the appearance of the radiograph. We know a large number of dental practitioners who say they do not want a radiograph made by a man who knows anything about dentistry because they do not want them telling their patients of the conditions which may be found in the radiograph as the result of the work which the dentist has done. Therefore, as a result of this attitude which the dental profession has assumed radiographic specialists or radiographic men who have no knowledge of dentistry have been able to exist and in some instances been able to build up large practices upon the jealousy or narrowness of the dental profession. It seems to us that the dentist is lowering his dignity by referring a patient to an x-ray man who has no knowledge of den-

tistry. In other words, he is calling into consultation with him on a professional matter a man who has no professional training. He is subjecting his patient to the hands of a man who has no knowledge of antisepsis and who is very liable to infect one patient from another because it is to be assumed that some time during the operation the x-ray man places his finger in the patient's mouth in placing the film. If this patient is syphilitic, infection may be carried to the next individual because of the inadequate knowledge which the radiograph operator has of those conditions. Without mentioning a large number of errors and false diagnoses which we have seen with radiographic lay operators, we contend it is a mistake for men to specialize as radiographers who have had no training other than a little knowledge of electricity.

While there is a need for regulation in all of the specialties, as well as radiography, the regulation of these specialties to a great extent lies in the hands of the dental profession. If the dental profession would insist that those who desire or claim to be specialists be trained along certain lines, take recognized courses in training, and avail themselves of every means of education possible to fit themselves for their specialty, we would soon have the "overnight specialist" eliminated because of lack of support. The dental profession should not support a man in a specialty simply because he is a good fellow and because he belongs to the same lodge, the same country club, or smokes the same brand of cigarettes as the dentist. A specialist should be judged upon his fitness; he should be judged upon his qualifications; he should be judged upon his standing in the dental profession; upon his ability as a man; and upon the attitude which he bears towards the code of ethics. The dentist assumes a certain obligation when he sends his patients to specialists, and assuming that obligation, he should insist that the patients be sent to men who are qualified along the lines indicated and who will not betray the trust that is given them.

Orthodontic Mechanics

IN this issue of the Journal is published a technical paper by Rudolph L. Hanau entitled "Orthodontic Mechanics: Dental Engineering." The paper is written from an engineering standpoint and may seem to be too technical to a number of orthodontic practitioners to have any practical value. Yet, it must be remembered that a certain part of the practice of orthodontia is necessarily mechanical, and a higher degree of efficiency will be maintained in the construction and use of regulating appliances if they are designed with a definite knowledge of scientific mechanical principles. The orthodontist who has a knowledge of scientific mechanics is better able to design and construct regulating appliances than one who has not that knowledge.

There has been a tendency among orthodontists for a number of years, and the idea has been fostered by the makers, patentees and dealers in appliances, that orthodontists should use appliances exactly as they were supplied by the manufacturer even if some small change would greatly increase the efficiency of the appliance. We realize that there is a great advantage in having appliances made by manufacturers but there is also a limit to the extent to which that is practical. To concede that a manufacturer who has never seen the particular

type of malocclusion can make an appliance which is best suited for that case and can make one which needs no adjusting, is claiming too much. We are willing to admit that appliances which have been manufactured by appliance makers have been used in the treatment of malocclusions and have accomplished very satisfactory results. We realize that there are certain mechanical principles that must be embodied in any regulating appliance and if an appliance is constructed to embody these principles, we can say that the appliance approaches a universal appliance as nearly as it is possible to have such an appliance. The use of the screw and the lever as combined in the alignment wire has for a long time been the most universal appliance that we have. Even with such a universal appliance as the alignment wire, the efficiency of the same can be greatly increased in certain cases by making changes in the appliance along scientific engineering lines.

The modification of a stock appliance to meet the requirements of certain cases often calls into use a knowledge of mechanics which is not possessed by everyone practicing orthodontia. In the use of regulating appliances it must be remembered that there are certain mechanical principles which have been recognized by engineers for years and which can be used to a great advantage in orthodontia. There are laws governing force, resistance, velocity, and power which should be remembered in the construction of regulating appliances. We do not mean that every appliance used on a case of malocclusion has to be different from the one previously used, but such changes as are made in regulating appliances must be made to conform with definite mechanical laws and not based on the idea of some manufacturer of appliances that are made to sell and not necessarily made to fit the individual case. Each appliance should be made so as to conserve the anchorage and resistance and constructed so as to utilize all of the forces of the appliance without causing any undesirable change in some other part of the mouth.

We believe it is time for orthodontists to realize that they must have a greater knowledge of physics and mechanics than they have had in times past. We believe a careful reading of the paper on orthodontic mechanics will be a great benefit to anyone interested in better mechanically constructed appliances. Not only should this paper be studied, but it would be time well spent for the majority of the orthodontic profession to take up a study of engineering principles and apply them to their work to a greater extent than they have heretofore. If this is done, we do not believe that the orthodontists will be imposed upon by manufacturers of certain types of appliances and we do not believe that they will be induced to use appliances which are woefully lacking in design, as some have done in the past.

Partial Program of the National Dental Association

UP to date the following reports have been received from the various Section Chairmen, Committeemen, etc.

SECTION I.

Chairman Dr. E. D. Coolidge, 59 East Madison Street, Chicago, Ill.

"Some Neglected Operative Pre-requisites," By Dr. Fred E. Hart of San Francisco.

"Porcelain Inlays" (exact title not yet chosen). By Dr. W. L. Fickes, Pittsburgh, Pa.

"Interpretation of Radiographs," By Dr. Howard R. Raper, of Indianapolis, Ind.

"Present Tendencies in Operative Dentistry," By Dr. J. M. Walls, of St. Paul, Minn.

Also an important paper dealing with the subject of dental education. Essayist not selected as yet.

SECTION II.

Chairman Dr. F. B. Moorehead, People's Gas Building, Chicago, Ill.

Dr. Virgil Loeb, of this Committee, reports that he has thus far accepted two essayists. Dr. Elmer S. Best, of Minneapolis, on some phase of root canal filling; and Dr. Howard R. Raper, of Indianapolis, on "Misinterpretation of Radiographs."

SECTION III.

Chairman Dr. L. E. Custer, 28 North Ludlow Street, Dayton, Ohio.

"Ionization, With Special Reference to Ionic Chemistry," By Dr. Geo. T. Fette, Cincinnati, Ohio.

"The Chemical Action of Soil Bacteria on Calcium Phosphates, With the Chemical Analysis of the Human Teeth," By Dr. J. E. Hinkins, of Chicago, Ill.

"Why Measurements of the Mandible, Tracings of the Condyles, the Construction of Hypothetical Triangles, and the Use of the Face-Bow, are all Non-Essential in the Construction of Dentures Possessing the Highest Degree of Efficiency," By Dr. D. D. Campbell, of Kansas City, Mo.

"Paper, subject to be announced later," By Dr. Calvin S. Case, of Chicago, Ill.

Also two other papers, titles of which will be reported later.

STATE SOCIETY OFFICERS' SECTION.

Chairman Dr. John C. Forsyth, 430 East State Street, Trenton, N. J.

First Session. "Some Phases of Post-Graduate Work," By Dr. B. L. Shobe, Tulsa, Okla.

"Securing Some Satisfactory Legislation," By Dr. Alexander H. Reynolds, Philadelphia, Pa.

The Second Session will be devoted to six or seven short papers of five to ten minutes each by men of different State Societies, telling of some outstanding feature of their State Society's work that is thought to be of the greatest importance, or, if the essayist prefers, he may present the weak part of the work and ask for suggestions to help them out. These papers are to be followed by a general discussion which we hope will bring out some very valuable points. The means of the essayists for this session have not as yet been secured.

COMMITTEE ON ANESTHETICS.

The Secretary of this Committee, Dr. Chalmers J. Lyons, of Ann Arbor, Mich., reports as follows:

"The Teaching of Conductive Anesthesia," By Dr. Theodore Blum, of New York City.

"After-Pain in Local and General Anesthesia," By Dr. A. E. Hertzler, of Kansas City, Mo.

"The Toxicity of Local Anesthetics," By Dr. Geo. B. Roth, of Washington, D. C.

COMMITTEE ON ENTERTAINMENT.

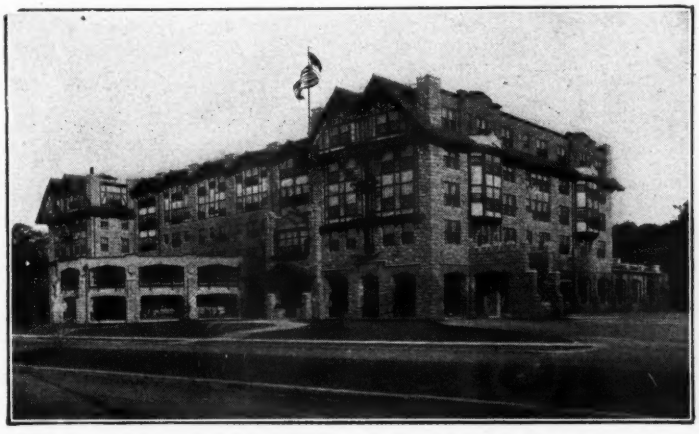
At a recent meeting of this Committee a Ladies' Auxiliary was organized, of which Mrs. M. L. Rhein was made the chief officer, and Mrs. Henry W. Gillett, 140 West 57th Street, New York City, Secretary. It would greatly facilitate the endeavors of the Ladies' Auxiliary to add as much as possible to the pleasures and comforts of the visiting ladies, if those who intend to come to New York would notify Mrs. Gillett, stating if possible, the hotel at which they will be registered.

R. OTTOLENGUI, Chairman Publicity Committee.

The Seventeenth Annual Meeting of the American Society of Orthodontists

THE Seventeenth Annual Meeting of the American Society of Orthodontists will be held at Excelsior Springs, Mo., September 5, 6, 7, and 8, 1917. Excelsior Springs is thirty miles northeast of Kansas City, "the Heart of America," and no other place can be reached so conveniently and quickly from all parts of the United States.

The meetings will be held at the Elms Hotel, which is conceded by all travelers to be unsurpassed by any hotel in the world. The beauty of its architecture, the



The Elms Hotel at Excelsior Springs, Mo.

charm of its interior arrangement, and the home-like atmosphere of every appointment, make it a desirable place to hold a meeting away from the noise and confusion of the large commercial hotels. The large shady lawns lend a restful air to the place, which invites one to combine business with pleasure.

The Board of Censors is preparing an unusually attractive program, which has been arranged as follows:

I. President's Address, Dr. M. N. Federspiel, Milwaukee; Report of the Board of Censors.

II. Anatomy and Physiology.—(1) The Evolution of the Human Teeth, Prof. H. F. Osborn, New York City.

III. Medicine and Therapeutics.—(1) Constitutional Diseases in Infancy and Dentition, Dr. Gustav Lippmann, St. Louis; (2) The Oral Efficiency of Therapeutic Preparations, Prof. Hermann Prinz, Philadelphia; (3) The Scientific Feeding of Growing Children, Mr. A. W. McCann, New York City.

IV. Surgery.—(1) The Surgical Treatment of Extreme Malformations Involving the Jaws, Tongue, etc., Dr. Gordon New, Rochester, Minn.

V. Radiography and Photography.—(1) Practical Radiography for the Orthodontist, Dr. E. H. Skinner, Kansas City; (2) Orthophotography and Multiview Projections, Mr. Rudolph L. Hanau, Pittsburgh.

VI. Etiology, Pathology, and Prognosis.—(1) A Further Study of Prenatal Causes of Dento-facial Deformities, Dr. B. W. Weinberger, New York City.

VII. Practice and Technology.—(1) Subject to be announced, Dr. Calvin S. Case, Chicago; (2) Further Experiences with the .020 Arch-wire, Dr. Ray D. Robinson, Los Angeles; (3) The Indirect Method of Anchor-band Construction, Dr. Martin Dewey, Chicago; (4) Subject to be announced, Dr. Lloyd S. Lourie, Chicago.

VIII. Legislation, Education, and Nomenclature.—(1) Report of the Committee on Education; (2) Report of the Committee on Nomenclature.

IX. Clinics.—A large number have already been secured, to be announced later.

X. Exhibits.—Manufacturers and publishers of books, periodicals, x-ray and photographic equipments, orthodontic appliances and supplies, have been invited to exhibit during the meeting.

Man-Power

I HAVE heard many stories (says "Diarist" in the *Westminster Gazette*) of the curious way in which "man-power" is estimated by the military authorities and by the tribunals. There seems to be no doubt that many men who ought to be in the Army are being enabled to avoid their obligations; but this mistake is certainly not counterbalanced by the fact that men are being taken into the Army who could be far more useful elsewhere. A huge military hospital that devotes its attention to wounds of the jaw had one man, and one only, who is an expert in the making of splints for the jaw. He has been "called up," and is possibly sweeping out a camp cook-house somewhere at present. Another hospital, in another part of the country, has lost several highly-trained, operating-theatre attendants. Each can probably do less than the work of an average soldier in the fighting line, but a score of average soldiers could not do his work at home.